

***Falkor* 2016 Cruise Report**

Mariana Back-arc

FK161129

November 29-December 20, 2016

***SuBastian* Dives S34-S49**

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R/V *Falkor* Captain: Heiko Volz

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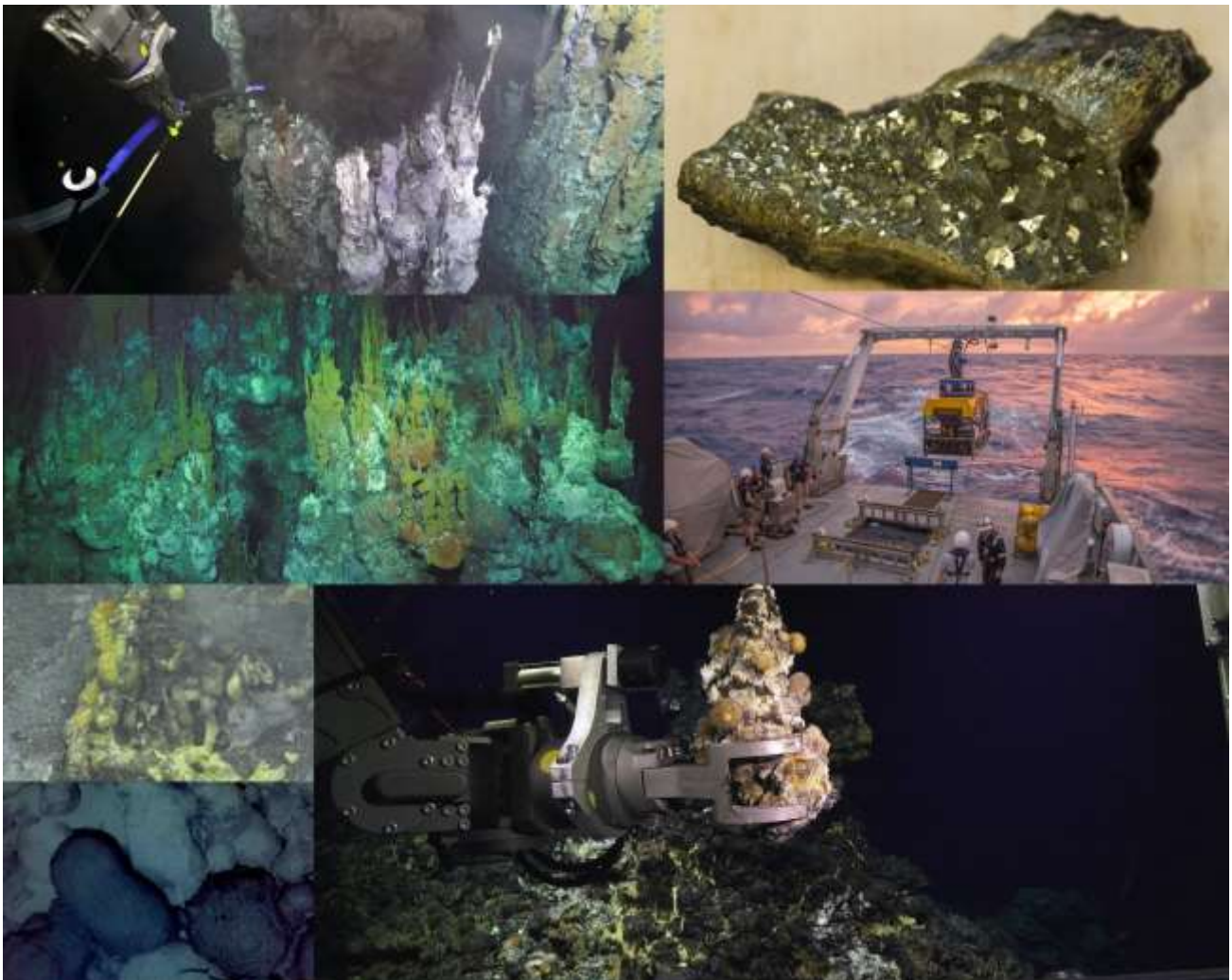


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1 - Expedition Summary

Dave Butterfield, Chief Scientist

This research cruise was the second half of a two-year project in the southern half of the Mariana back-arc made possible by major funding from two sources. The Schmidt Ocean Institute (SOI) provided the research vessel *Falkor* and the ROV *SuBastian*. The NOAA Office of Exploration and Research provided essential science support, including funding for travel and shipping. Additional support came from the National Geographic Society (travel and supplies for V. Tunnicliffe and A. Bates), NOAA PMEL, and from the institutions of all the scientists. The science team is grateful for the opportunity to conduct research in this important ocean region. The entire northern half of the back-arc remains to be explored and we hope to be back.

The science team would also like to thank Captain Heiko and all of the *Falkor's* crew for making us feel welcome and safe working on board. The ship-handling and station-keeping were excellent during challenging weather conditions. The stewards kept us well-fed, and even delivered treats to the ROV control room! The engineers helped us with lab setup, instrument fabrication ('Hula' array) and replaced a filter canister for HFPS that was lost overboard. We also want to thank Jason Williams, John Dunn, the entire ROV team, and the Marine Techs (Leighton Rolley and Veit Huehnerbach) for their tireless work in getting the ROV in the water as much as possible, making changes as we went along, keeping the data flowing, and running the multibeam system and performing CTD casts. The entire SOI team did everything possible to maximize our productivity during the cruise.

Research Goals

Exploration of deep-sea volcanoes and hydrothermal systems has been pursued actively for nearly 40 years since the discovery of the first hydrothermal vent site at the Galapagos spreading center in the late 1970s. The geological, chemical, and biological observations from the hundreds of known vent sites around the globe have resulted in an emerging realization that plate tectonics and biological communities are linked by multiple processes. Two examples: i) topographic steering of deep ocean currents influences larval dispersal patterns and transport through the water column to colonize distant habitats, and ii) variation in magma composition and volatile content across different geologic settings (ridge, arc, back-arc, hotspot) controls vent fluid chemistry and may thereby limit larval recruitment if environmental conditions in a given setting exceed the physiological tolerance range of organisms evolved in a different geological setting. In the global context, back-arc hydrothermal sites are poorly represented in the vents database (Figure 1-1) and the Mariana back-arc still has vast areas that have not been systematically explored for hydrothermal activity. Only the Alice Springs vent sites near 18.2°N and a few sites near the southern terminus of the back-arc were previously known. Our major objective for this cruise was to determine the geological, chemical, and biological characteristics of several newly discovered vent sites along the Mariana back-arc between 14.5 and 18.5°N and to use that information to better understand the links between tectonics and biological community structure worldwide.

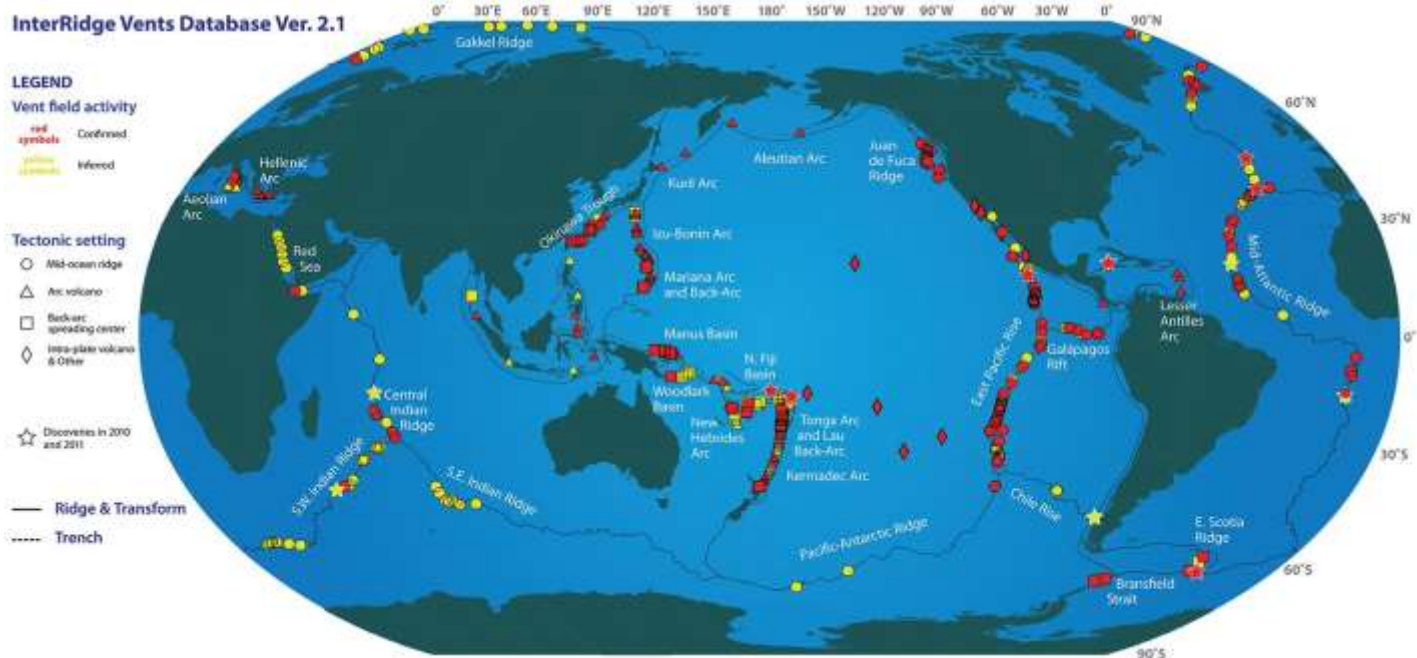


Figure 1-1 Global distribution of deep-sea hydrothermal vent sites. The western Pacific has been a frontier of research on arc and back-arc environments, and the Mariana back-arc represents a significant, underexplored region.

This research can help to answer a host of questions. Does tectonic setting determine the chemistry of hydrothermal fluids and does that in turn limit the species that can colonize sites? What are the systematic variations in fluid chemistry between different geologic settings? Do microbial communities differ across arc and back-arc settings? Are differences in microbial communities directly linked to differences in properties of vent fluids or available chemosynthetic energy? What species occur at arc and back-arc sites that are relatively close together? Is physical transport of larvae from one site to another the key factor in determining biological community structure and the distribution of species around the globe?

The extreme chemical variation at the intersection of the Mariana arc and back-arc provides an ideal place to test the influence of tectonics and chemistry on chemosynthetic ecosystems. Chemical differences in hydrothermal sites are linked directly to the large-scale tectonic environment and the local geology as these two factors control the size, depth, and location of the heat source, the redox chemistry and volatile content, and the hydrothermal circulation pathways. The overarching goal is to discover what factors control the striking differences observed in the biological communities that live at hydrothermal vents in the Mariana arc and back-arc, and what implications this has for links between the solid-earth, the hydrosphere, and the biosphere on a global scale. This research is important because the Mariana vents are at the crossroads between biogeographic provinces of deep-sea vent fauna in the NW and SW Pacific. By conducting this study, we will not only make important advances in the basic understanding of biodiversity, connectivity, and biogeography at deep-sea vents, but also will provide results directly relevant to the conservation and management plan of the new Mariana Trench Marine National Monument.

In order to address the large issue of how tectonics is linked to seafloor biology, we first have to improve our global and regional knowledge of hydrothermal systems. After decades of deep-sea research, there was still very little data from the Mariana back-arc, so we proposed a two-part project to locate new hydrothermal sites through seafloor mapping and water column studies (done in 2015), followed by this 2016 ROV exploration of those new seafloor sites. The data collected during this expedition will complement the extensive data already collected from the Mariana volcanic arc and from the far southern Mariana back-arc. Eventually, we hope to complete the exploration of the northern half of the Mariana back-arc to have a complete regional picture.

Our specific objectives for this research expedition were based on what we could reasonably hope to achieve with a team of 9 scientists on board working with the entirely new SOI ROV *SuBastian*. To achieve our primary goal, we focused on surveying 4 primary back-arc sites, finding hydrothermal activity, and collecting representative vent fauna, hydrothermal

fluids for chemistry and microbiology, volcanic rocks and hydrothermal mineral samples. We considered an additional element (highly desirable for our research goals, but not proposed for this expedition) of larvae collection to address biogeographical questions, but we did not have the specialized larval collection tools nor enough scientists on board to collect the data required to address the problem. We therefore focused on the primary mission of finding and characterizing hydrothermal sites on the back-arc.

A second objective, in addition to the back-arc work, was to gain a better understanding of the ecology of the flatfish (*Symphurus thermophilus*) that are found only on sulfur-rich submarine arc volcanoes. The reasons for the association of this flatfish with actively forming sulfur deposits and its main sources of nutrition are poorly understood, at least in part because few specimens have been collected. Specifically, we wanted to collect enough fish specimens from Daikoku (a known sulfur-rich volcano that erupted in 2014) to do a population study, look for evidence of a symbiosis involving sulfur-cycling microbes, and characterize the fluid chemistry and sedimentary environment where the fish live.

Chronological Summary

Our initial plan and intention for this expedition was to begin diving at the southern back-arc sites, which would be less than 24 hours transit from Guam and would allow us to start with a relatively simple dive (in terms of ROV operations) at the 15.4°N lava flow site. However, winds and seas were too high to allow diving at any of the southern targets, so we quickly decided to continue the transit north, where the weather conditions were much calmer. We left port on the morning of November 29th, as scheduled, and continued in transit north toward Daikoku (intended to be our final dive site, and definitely not a simple site in terms of ROV operations). In transit we continued to monitor the weather in case conditions should improve enough in the south to allow diving at any of the back-arc target sites along the way, and we were at the Alice Springs site at 18.2°N at first light on Dec. 1 to check diving conditions, but it was too rough to dive, so we continued north. We collected multibeam bathymetry data along the way to fill in gaps in the preexisting bathymetry. We continued to set up the science gear (Hydrothermal Fluid and Particle Sampler, fish traps, bioboxes, scoops, markers, MAPR instrument on the ROV for real-time display of ORP data, construction of a temperature recorder array, preparation of the laboratories for sample processing, analysis, and shipboard experiments) write dive plans for Daikoku, plan ROV watch schedules, and set up the ROV control room for data logging. During this cruise we were only able to make 12-hour ROV dives each day (generally from 6am-6pm, local, deck-to-deck) due to the limited staffing and berthing on *Falkor*.

Although we conducted mapping operations during this bad-weather transit, it did cost us 2 dive days (Nov 30 and Dec 1) because we normally would have done the shorter transits between sites overnight and conducted ROV dives during the day.

The default plan for ROV diving was to launch at 0800 and recover at 2000. Due to concern about recovering the ROV in the dark for the first dives, we tried to launch and recover earlier. (First light was about 0630 and sunset was about 1800). We arrived at Daikoku in the early morning of Dec 2 local time, and made some slow multibeam passes over the volcano. Water-column gas bubble plumes were seen emanating from several areas around the summit before the start of the ROV dive. Our first dive (S34) launched shortly after 0700 local time on Dec. 2 and we were on the seafloor by 0742. The ROV dive progressed well. We explored the area around the sulfur pond on the outer slopes of the summit in the NW quadrant. Flatfish (*Symphurus thermophilus*) were numerous throughout this area, as were Gandalfus crabs. Efforts focused on sampling flatfish, recording temperature, pH and Oxygen data in and around sediments, and fluid sampling. In the last third of the dive we tried to observe the molten sulfur pond, which seemed to have retreated down into a depression with steep sulfur walls around it and very poor visibility. While traversing over the sulfur pond there was a burst of material which resulted in a coating of sulfur on the front bottom of the ROV. The dive was terminated slightly early when this occurred. No harm was done, but it was a dramatic and messy, yet highly successful first science dive for *SuBastian*. The ROV and science gear were cleaned up after the dive and S35 got underway the next morning. We continued with fish sampling, fluid sampling, sensor measurements, and observations of molten sulfur and gas venting phenomena. We watched the formation of sulfur-coated gas bubbles blown out of tiny sulfur tubes around the edges of the sulfur pit, saw these sulfur bubbles in the water column near the sulfur pit, and collected surface sediments dominated by them. We transited up to the crater rim to find and sample a tubeworm bush on the inner wall of the crater. Visibility down in the crater was too poor to allow sampling in the deeper parts of the crater, so that part of the dive plan was abandoned. The ROV performed very well during these first two dives at Daikoku. However, sampling the flatfish with the

suction sampler or nets was much more difficult than anticipated, and the fish traps were not very effective. If these dives had occurred after the ROV pilots and scientists had more practice using the suction sampler, we probably would have had better success in sampling the fish. In the end, we did not capture enough fish for a population study. Furthermore, the HFPS did not function well, and we managed to get only 7 successful fluid chemistry samples over the 2 dives. Although our sampling success at Daikoku was poor, the video observations were spectacular, and we collected good data using the in-situ pH and O₂ sensors on HFPS.

Because the weather was still poor to the south, we elected to dive on Chamorro seamount (20.8°N, 144.7°E) for the third dive (S36). Weather was marginal at the start, and worsened when we reached the seafloor. With only one hour and twenty minutes total on the seafloor, we located a hydrothermal chimney at 920 meters depth, collected a chimney sample with hairy snails attached, and collected two successful fluid chemistry samples. Maximum measured fluid temperatures here were near 160°C. Although the dive was very short, we were able to make good observations and take essential samples to characterize this moderate-temperature arc site. Verena Tunnicliffe indicated that the snail species at Chamorro was very similar in appearance to one seen only at E. Diamante Seamount further south on the arc, so the samples are significant in a regional context. Weather cost us again on this dive, as the dive had to be terminated early.

We made the transit south to the Alice Springs area (18.2°N, 144.7°E), collecting multibeam data en route. Dive S37 at the Illium vent field began and ended on time. In the nearly 5 hours of bottom time, we explored the area of previously described venting, using our 2015 plume and AUV surveys for guidance, and located diffuse venting sites near the top of a ridge at 3582 m depth. There was a wide range of fauna around the vent sites, including anemones, squat lobsters, hairy snails, crabs, shrimp, barnacles, etc. The depth of the vents did not match the description in the early publications, but we found what appeared to be *Alvin* or *Shinkai* dive weights in several spots, so this was clearly the site of earlier work. There were no high-temperature smoker vents, but many inactive, oxidized chimneys. The following two dives at Alice Springs proper (S39 with venting at 3610-3625 m) and the Burke field (S40 with venting at 3630 m) revealed very similar vent sites. There were no active high-temperature smokers observed at any of the sites, although there was hot (up to 165°C), clear, shimmering water in places. Although we recovered only one good fluid chemistry sample from Illium, we had good success at the Alice Springs and Burke fields. The overall impression of these sites in 2016 is that the chimney-building stage is over, chimneys are in a state of decay, and the heat flux is declining, but there is still sufficient energy to fuel rich and diverse biological communities. We devoted one dive to each vent area and in each case, we were able to collect representative samples of the biology, fluid chemistry, and mineralogy of the sites.

Dive S38 was aborted due to a ground fault eventually traced to the MAPR after first suspecting the HFPS, and by the time it was diagnosed as a bad MAPR cable and fixed, there was insufficient time to make a dive, so we missed one day of diving because of faulty science equipment. The MAPR and HFPS were on the same power circuit, so we could not simply isolate and turn off the MAPR and continue with the dive.

We elected to move south to the 17°N site rather than stay one more day in the Alice Springs area to complete a dive on the 'Central Trough' site at 18.047°N. The priority was to dive at the new, unexplored sites further south. If everything went well for the rest of the expedition, we could potentially come back to the Central Trough site. As it turned out, we did not, so that last vent area at Alice Springs was not revisited.

The next 4 dives (S41-S44) were the most exciting of the expedition. We knew there were spectacular chimneys at this site from one *Okeanos Explorer* ROV dive that took place in April 2016, guided by our results from the December 2015 *Falkor* 'Hydrothermal Hunt' expedition. Having 4 dives (with an average of 8 hours on bottom per dive) to thoroughly explore and sample this high-temperature vent field was very rewarding. The vent field has a clear gradient in vent structures along its west-east trend. There are two massive and tall (16 and 30 meters) chimneys on the western end of the field, with multiple, vigorous, high-temperature black smoker vents, large protruding flange structures, and tall slender chimneys, some active and some inactive and oxide-coated. Animals (hairy snails, crabs, shrimp, limpets, sulfide worms) were moderately abundant near active portions of the chimney structures. To the east of the two largest chimneys were two smaller chimney structures characterized by veritable thickets of small, slender, stick-like chimneys with active high-temperature venting. Continuing east, there is a 40-m diameter, circular crater (named Voodoo Crater) with active diffuse venting in many places on the rim and the interior of the crater. The material making up the crater rim here is

hydrothermal sulfide and not volcanic rock. There were very dense communities of animals at the Voodoo diffuse vents, and we chose this site for an intensive study of the temperature and chemistry of habitat zones around a vigorously flowing diffuse site. Moving further to the east, we found low, flat sulfide mounds with lower temperature and less vigorous diffuse venting. Beyond this, the venting died out. Overall, hydrothermal venting extends for more than 400 m east-west across this vent field, somewhat like a hotspot island track, with the hottest and most active vents on the west, and older, progressively eroded and weaker vents to the east. We collected an excellent set of hydrothermal vent fluid and chimney samples from this vent field, so that we can relate the composition of the vent fluids to the chimneys, and potentially get ages from barite in the chimneys that will help constrain the age and longevity of venting at this site. We named the vent field Hafa Adai for the Chamorro language greeting used in the nearby Mariana islands. This vent field is in a state of very active chimney growth with a high hydrothermal heat and mass flux, in contrast to the weak venting seen at the Alice Springs sites and the 15.5°N site further south.

After four successful dives at the Hafa Adai vent field and vicinity, we moved south to dive at the recent 15.4°N lava flow site and to look for the undiscovered vent site ~6 km north of the lava flow at 15.5°N. After an overnight transit, we began dive S45 at the lava flow on December 12. One year earlier, we had seen significant water column plumes above the lava flow and images of cloudy water were captured by a *Sentry* photo survey, but we saw no active during this dive. The recent pillow lava flow had lots of orange hydrothermal sediments in the crevices and low spots, and the occasional polynoid scale worm swimming in the water just above the bottom, and at least one area with a noticeable ORP anomaly, but no visible hydrothermal flow and no sites that had been colonized by hydrothermal vent fauna. Basalt samples were collected from 6 sites. The wind speed increased to near 25 knots so the dive was ended early after 3 hours and 45 minutes of bottom time. Weather was very rough during the recovery, with the ship rolling and pitching, and it was difficult to get the ROV back on board, but the ROV team handled it well and got the ROV safely on deck.

The end of dive S45 marked the end of a period of good weather and trouble-free ROV dives and the start of a period of marginal-to-bad weather that would last until the end of the expedition, and combined with ROV system problems, made it very challenging to get the ROV back in the water to explore the 15.5°N vent field. We did not see the seafloor again until the afternoon of December 16 local time.

The weather on December 13 was too rough to dive, so we conducted our first CTD ops of the cruise, with one vertical cast over the 15.5°N vent area and a second CTD cast over WP9 of the 15.4°N recent lava flow. There was a clear plume over the vent area to the north, but no apparent plume over the lava flow. This is a significant change from the previous year.

On the morning of December 14, local time, we began to launch the ROV at the 15.5°N vent area, but there was a serious winch power problem and the ROV dive was immediately aborted before launching. The problem was found to be a failed 'chopper' or power regulator. The ROV system has two of these units, both needed for operations, and one had failed during the engineering test cruise one week before FK161129. We had no spare on board because the manufacturer could not deliver a new spare in time before we left port. The spare part was in Guam with the agent and our only recourse was to return to Guam (~10 hours transit time), pick up the part and return to our dive site. The part was delivered to the ship just outside the port at 6:30pm local time, and the ship stayed in the lee of the island there long enough to provide a stable ship to do troubleshooting of the satellite internet connection, which had been working very poorly for a couple days. The troubleshooting did not resolve the internet issue, but we returned to the dive site overnight and were on site by first light on Dec 15. After installing and testing the chopper overnight, the ROV group was ready for an early launch. However, shortly after entering the water (Dive S46), there was a dive-terminating ground fault and the dive was aborted. It was quickly determined that there was a short somewhere in the main cable. After some troubleshooting, it was determined that the fault was probably due to a break in the cable sheath and insulation somewhere near the ROV end of the cable. Electrical resistance measurements gave a very rough estimate of how far up the cable the break was. The ROV team took the approach of repeatedly cutting off smaller segments (~50 m length) and testing. Eventually, enough cable (~170 m total) was removed and the short was gone. Cable re-termination was then completed and the ROV was back in the water at 13:45 on Dec 16 to finally begin the search for hydrothermal vents at the 15.5°N site. It was at this time that we decided to name the field 'Perseverance'.

In order to make up for lost time, the ROV group volunteered to do longer than usual dive to maximize the bottom time at the Perseverance vent field. Dive S47 began in the afternoon of Dec 16, intending to stay on bottom for extended exploration and sampling. However, the dive had to be ended before midnight because of rapid depletion of the hydraulic compensation reservoir (which typically occurs the first dive after a cable re-termination). Following a search pattern based on bathymetry and ORP sensor anomalies from 2015, we found hydrothermal venting within one hour of reaching the seafloor. Active venting was seen at depths from 3915 to 3905 meters, near the SW base of a hill with a summit at ~3890m. During 3 dives with a total of almost 12 hours of bottom time, we searched the slopes of this hill and the valley between this hill and the near-vertical scarp to the west, but we found no other active venting. We did not have time to cover areas farther north, but we covered the areas where the largest ORP anomalies were seen by Sentry in 2015. The chimney structures here were in a state of decline. Large chimneys were tilted or toppled and coated with orange oxides. There were limited areas of hot, clear water venting from sulfide chimneys with white microbial mat coatings (Leaning Tower, Stump of Mystery, and Palisades). Temperatures were up to 265°C and fluids were clear at the orifice (at top of Stump with HFS T probe). Before the end of dive S47, we had sampled vent fauna, chimneys, and fluids (the latter with HFS and a gas-tight sampler).

The science team and the ROV team worked overnight to process samples and prepare for the next dive as soon as possible. The ROV was only on deck for about 4 hours and went back in the water at 0542 on Dec 17 for dive S48. We managed to make a transect up the hillside, finding the vent we would call Palisades, but the dive was terminated after one hour on bottom due to a loss of telemetry, and the ROV was back on deck before noon. The experience of back-to-back dives confirmed that we could not sustain 24-hour operations with the limited number of personnel on board. We would return to a normal schedule and attempt to dive the next morning, weather permitting.

The weather and forecast were indeed marginal at first light on Dec 18 local, and if the weather forecast was accurate, this would very likely be the last dive. Dive S49 launched at 0800 and was at approximately 2500 m depth when a squall passed, winds exceeded 25 knots, and the ship was temporarily blown off-station. Based on standard operating procedure, it was decided to end the dive, but the squall passed quickly and winds dropped significantly, so the decision was reversed (with a good deal of discussion) and the ROV started back down, this time reaching the bottom. We spent a lot of time trying to get a second gas-tight sample from this field, at the top of Stump, but the operation did not go well. We attempted to sample biota, fluids, and microbes from a site called Limpet Canyon near the base of the Leaning Tower vent, with partial success (HFS did not function well and sampling for biology was difficult). We searched the surrounding area again for other vent sites, but found none. The dive was ended due to deteriorating weather after almost 3.5 hours of bottom time.

The weather was now too rough to dive anywhere in our radius of operations, and the forecast was for it to get worse over the next 2 days. This meant that we could not dive on our last potential dive day (Dec 19). Without the ROV, there were no operations possible to address our science goals. We discussed the idea (suggested by Leighton Rolley) of diving on a World War 2 airplane wreck near one of the islands if local weather conditions would allow it, but rejected it because it had no connection to the science objectives of our expedition and we had no expertise in this potentially controversial dive target. We also decided not to put the ROV in the water in the lee of Guam simply to have a last dive (if wind conditions would even allow it), because we had no dive target of interest. It was therefore decided to go into port one day early. Weather conditions did worsen, and it was not possible to dive anywhere within range of Guam on Dec 19. We arrived back in Guam harbor on the morning of Dec 19.

Accomplishments and Relevance.

New knowledge: by exploring and sampling two newly discovered vent fields and re-sampling another three fields not seen since 1992, this mission has established that there is a very consistent vent fauna community across vent fields spaced ~170km apart along the Mariana back-arc. The back-arc vent fauna and back-arc fluid chemistry are significantly different from the shallower nearby volcanic arc sites, supporting the idea that large-scale tectonic processes create diverse geochemical conditions that affect biological communities.

Next steps: the many biological, chemical, and geological samples collected during the mission with the ROV *SuBastian*

must now be analyzed in shore-based laboratories to generate detailed datasets (fluid/gas composition, biological and microbiological species identification/abundance/distribution, volcanic rock and hydrothermal mineral composition) to test these ideas. Project PIs will work together to understand how geological, chemical, and biological processes are linked and how the new regional perspective on back-arc hydrothermal systems fits in a global context.

Who cares?: This work in and near the Mariana Trench Marine National Monument contributes to the overall understanding of deep-sea ecology and reveals amazing new hydrothermal sites on the back-arc to the public, government agencies, and scientists. There was keen national/international public interest in the live streaming of our expedition, and the people of Guam and CNMI are very curious about what exists in the waters surrounding their islands. With growing industrial interest and planning for deep undersea mining of mineral deposits, understanding the ecosystems of hydrothermal vents and how they are affected by disturbance is critical for environmental assessments and minimizing harm to the marine environment that is vital to the health of our planet.

2 - Cruise Participants

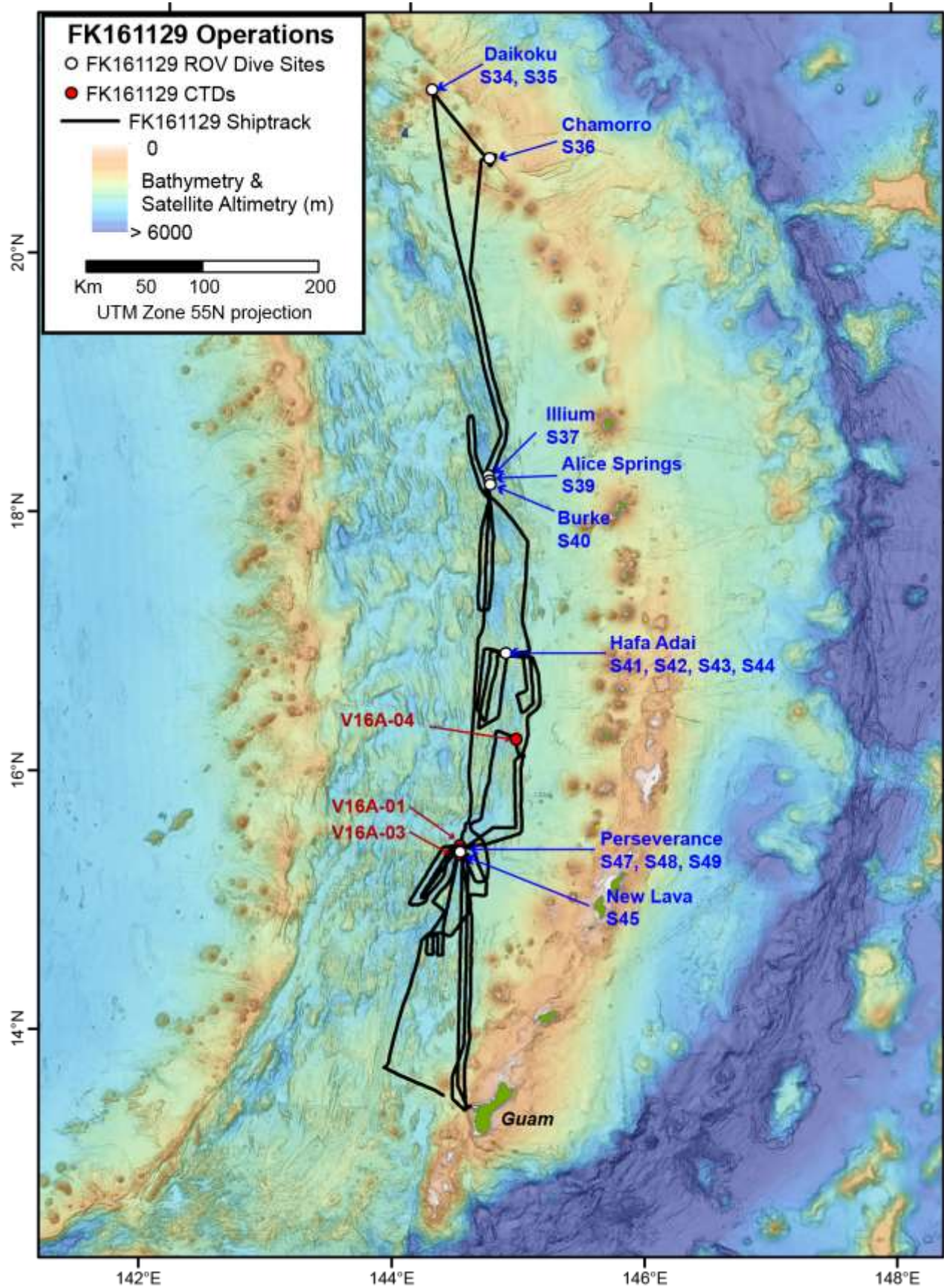
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3 - Operations Log and Map

UTC Date	Time	Local Date	Time	Activity
28-Nov	21:50	29-Nov	7:50	Depart Guam; logging EM302
29-Nov	22:00	30-Nov	7:00	Arrive at Dive Site (New Lava Flow, 15.4°N)
30-Nov	0:58		10:58	Dive canceled due to weather; heading north to Alice Springs
	20:30	1-Dec	6:30	At Alice Springs Site
	20:44		6:44	Dive canceled (weather); heading to Daikoku
1-Dec	21:02	2-Dec	7:02	Dive S34 at Daikoku; <i>SuBastian</i> off deck
2-Dec	4:32		14:32	end S34; <i>SuBastian</i> on deck
	6:30		16:30	EM302 survey of Daikoku summit
	21:32	3-Dec	6:00	Dive S35 at Daikoku; ROV in water
3-Dec	7:21		17:21	S35 off bottom; end of dive
	~08:30		~18:30	Multibeam survey to Chamorro
3-Dec	22:55	4-Dec	8:55	Dive S36 Begin at Chamorro; <i>SuBastian</i> off deck
4-Dec	0:57		10:57	Dive ends prematurely due to wind
	3:15		13:15	Transit to Alice Springs; EM302 mapping
	21:38	5-Dec	7:31	Dive S37 at Illium; ROV in water
5-Dec	4:54		14:54	S37 off bottom; end dive
				EM302 mapping between dives
	21:00	6-Dec	7:00	<i>Dive S38 at Alice Springs aborted</i> due to ground fault
6-Dec	0:15		10:15	Dive S39 at Alice Springs begin; ROV in water
				EM302 mapping north of site between dives
	21:24	7-Dec	7:24	Dive S40 at Burke Field; ROV in water
7-Dec	6:31		16:31	S40 off bottom; end dive
				EM302 mapping en route to 17°N site
	20:00	8-Dec	6:00	At 17°N site (Hafa Adai)
	20:58		6:58	Dive S41 at Hafa Adai begins; ROV in water
8-Dec	7:26		17:36	S41 off bottom; end dive
				EM302 mapping East side arc south of site
	21:05	9-Dec	7:05	Dive S42 at Hafa Adai begin; ROV in water
9-Dec	7:37		17:37	S42 off bottom; end dive
				EM302 mapping between dives
	21:20	10-Dec	7:20	Dive S43 at Hafa Adai begins; ROV in water
10-Dec	7:38		17:38	S43 off bottom; end dive
				EM302 mapping between dives
	23:43	11-Dec	9:43	Dive S44 at Hafa Adai begins; ROV in water
11-Dec	8:21		18:21	S44 off bottom; end dive
	23:03	12-Dec	9:03	Dive S45 at New Lava Flow site begins: ROV in water
12-Dec	5:06		15:06	S45 off bottom (early due to winds); end dive; scary recovery
	21:58	13-Dec	7:58	CTD V16A-01 at 15.5°N New Vent Site

UTC Date	Time	Local Date	Time	Activity
13-Dec	2:35		12:35	V16A-01 on surface.
				CTD V16A-02 at WP-09 over new flow; aborted due to noisy LSS.
	6:25		16:25	V16A-02 on deck
	6:30		16:30	CTD V16A-03 in water at WP-09 (new lava flow site, dive S45).
	21:00	14-Dec	7:00	First attempt at Dive S46 at 15.5°N vent field.
	21:11		7:11	S46 aborted before launch; winch power problem
14-Dec	8:50		18:50	Rendezvous outside Guam harbor to pick up winch part
	20:30	15-Dec	6:30	Second attempt at Dive S46 at 15.5°N vent field: ROV in water
				<i>S46 dive aborted</i> ; major faults on ROV; cable re-termination
				CTD V16A-04 at 16.3°N off-axis seamount summit
15-Dec				EM302 multibeam surveying
16-Dec	3:46	16-Dec	13:46	Dive S47 at Perseverance; ROV in water
	13:28		23:28	S47 off bottom; end of dive.
16-Dec	19:42	17-Dec	5:42	Dive S48 at Perseverance; ROV in water
	23:07		9:07	S48 off bottom; telemetry problems; end of dive.
17-Dec	22:07	18-Dec	8:07	Dive S49 at Perseverance; ROV in water
18-Dec	6:00		16:00	S49 off bottom; end of dive
18-Dec	22:00	19-Dec	8:00	Arrived in Guam

Fig. 3.1 Operations map



4 - Discipline Summaries

4.1 Geology

Heidi Berkenbosch and Bill Chadwick

4.1.1 Sulfide Sampling

Sulfide samples were collected by ROV *SuBastian* during *Falkor* cruise FK161129. Sulfide mineralogy and geochemistry will aid in understanding the physicochemical conditions of the vent fluids from which they formed, and the environment upon which biological species are living. Isotopic analysis of the sulfides will also help determine the age of the different hydrothermal sites. Samples of lava were also collected and are described in another section.



Figure 4.1.1-1 Coating of sulfur from Daikoku on dive S34.

Five samples of native sulfur chimneys and crust were collected at Daikoku seamount (dive S34) including unintentional sampling of quenched molten sulfur on the frame of *SuBastian* (see photo left). One sample was taken from an active chimney venting clear fluids at Chamorro volcano before the dive was aborted (dive S36). One sample of highly oxidized pieces from an old chimney was collected at the Illium vent field (dive S37), as well as a piece of basalt with an alteration rim at the Burke vent field (dive S40) both in the Alice Springs area (18.2°N back-arc segment),

Twelve samples in total were collected at the Hafa Adai vent field on the 17.0°N back-arc segment (dives 41- 44) and will be described here going west to east along the different vents. The Two Towers site was a very large structure (~16 m) that split into two active “branches” at the top. Two active chimney samples were collected here including a thick (~2 cm) piece of chalcopyrite from a chimney vigorously venting black fluids up to 348°C (fluid samples S44-HFS-03, -04, -05, -10, -11 and a gas tight sample S44-GTB-06 located at top of one of the Towers). The Sequoia site was an even larger chimney structure (30 m high) that had a thick trunk from which large flanges protruded, one near the base and one near the top. The flanges were the most active part of the structure. Four chimney samples were taken at Sequoia: three were from active chimneys and the fourth was a piece of sulfide crust taken from near the base. One sample of fresh chimney pieces was collected from the Alba vent site. Three pieces of sulfide were collected from Voodoo Crater. These were thought to be lava samples when collected, and it was a

surprise to discover they were made of sulfide. It became clear that the entire cone at Voodoo is formed from apparently exploded sulfide blocks – which remains enigmatic. One large and one small sample of old, inactive chimneys were collected at Waypoint 7 and 8, respectively (older chimneys at the eastern end of the line of vents). One sample of highly oxidized chimney material was collected to the north of Hafa Adai vent field.

In general, the active chimneys from Hafa Adai were extremely friable and hard to collect by manipulator arm without breaking into many small pieces. Old chimneys were easier to collect as the most friable material appeared to have worn away leaving stronger chimney remnants behind. The most high-temperature, black-smoker vents were at the west end of Hafa Adai (Sequoia and especially Two Towers), and venting volume and temperatures dropped going east. An interesting occurrence was the formation of many narrow and tall chimneys (“chimlets” of diameter <2 cm and height up to ~60 cm). There were relatively few of these chimlets at Two Towers and more on the flanges at Sequoia, but they became abundant particularly at the central vent sites of Chimlet Garden (image right) and Alba (image below). The chimlets were also prevalent but mostly dead at the most eastern vents at Waypoint 7 and 8, which had only light, diffuse flow.

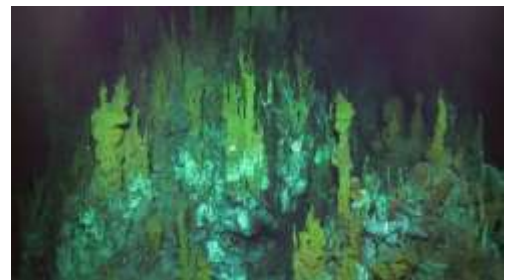


Figure 4.1.1-2 Chimlet Garden site at Hafa Adai.

The final two sulfide samples were collected from the Perseverance vent field (dive S47) at the 15.5°N back-arc segment, both from the “Stump of Mystery” chimney.



Figure 4.1.1-3 Close-up of Alba sulfides at Hafa Adai.

Sulfide samples were sent to Cornel de Ronde at GNS Science. He plans to have them analyzed for bulk geochemistry to determine their composition, S isotopes to detect magmatic sulfur, and Ba isotopes for their ages. A “quick index” is included below lists the sulfides (or altered rock) collected followed by detailed descriptions of each sample.

Table 4.1.1-1 Sulfide Sample Quick Index

Sample Name	Type	Location
S34-Geo-07	Pure Sulfur chimney	Daikoku
S34-Geo-08	Sulfur and ash crust	Daikoku
S34-Bio-09	Grey Sulfur “tadpoles”	Daikoku
S34-Geo-10	Sulfur and ash crust	Daikoku
S34-Geo-12	Sulfur encrusted on <i>SuBastian</i>	Daikoku
S36-Geo-01	Fresh chimney pieces	Chamorro
S37-Geo-01	Highly oxidized chimney pieces	Alice Springs- Illium
S39-Geo-11	Pillow basalt	Alice Springs- Alice Springs
S40-Bio-10	Basalt with alteration rim	Alice Springs- Burke
S41-Geo-01	Fresh chimney	Hafa Adai- Two Towers
S41-Geo-08 & 09	Fresh chimney pieces	Hafa Adai- Sequoia
S41-Geo-11	Large, old chimney	Hafa Adai- Waypoint 7
S42-Geo-12	Sulfide rock, inside cone	Hafa Adai- Voodoo Crater
S42-Geo-13	Sulfide rock, outside cone	Hafa Adai- Voodoo Crater
S42-Geo-20	Fresh chimney pieces	Hafa Adai- Sequoia
S42-GTB-21	Fresh chimney pieces	Hafa Adai- Sequoia
S42-Geo-22	Old sulfide crust	Hafa Adai- Sequoia
S42-Geo-23	Small, old chimney	Hafa Adai- Waypoint 8
S43-Geo-02	Highly oxidized chimney pieces	N of Hafa Adai
S43-Geo-08	Fresh chimney pieces	Hafa Adai- Alba
S44-Geo-07	Active, high-T chimney pieces	Hafa Adai- Two Towers
S44-Geo-08	Sulfide rock, outside cone	Hafa Adai- Voodoo Crater
S47-Bio-08	Old chimney piece	Perseverance- Stump of Mystery
S47-Geo-13	Fresh chimney pieces	Perseverance- Stump of Mystery

Sulfide sample descriptions:

Dive S34

First SuBastion scientific dive ever! Daikoku Seamount. Fish Spa area and surrounds, also looked for molten S pools but not seen. Dive aborted due to molten S crusting skids!

S34-Geo-07- Pure S chimney (“chimlet”) comprised of fused molten S droplets. Gas bubbles and shimmering fluid were venting when sampled. Was at edge of fissure in sediment releasing gas, white smoke and shimmering fluid, along with other small chimneys. 16 x 9 cm. One main conduit ~4 cm diameter at the base and 2 cm at the top with smaller conduit branching off to the side (4 cm long, 1 cm conduit). Inside conduit is smooth and undulating, mostly dark grey at base and grading to pale yellow at top. Chimney wall is 3 cm thick max at the base and 2 mm at top. Outside has masses of S globules 11-1 mm, pointing outwards or down. Mostly dark grey but bits and globules of pale yellow mixed through, about 25%. Trapped gases bursting globules when brought to surface with popping and little shards flying off. Whole thing very friable and falling apart just sitting on the table. Same location as HSF-03, -04.

S34-Geo-08- S crust that looked very white on video. Was on small mound behind fissure that Geo-07 came from. Fell apart when tried to sample and one piece scooped up, about 17 x 10 cm, but broke into several small pieces when taking it off of ROV. Layered crust of S and ash. S is bright to pale yellow in smooth layers ~3-4 mm thick or aggregates of globules that range from yellow-grey. Ash is grey to white in ~1 mm layers. Whole thing friable and also popped with gas release on surface.



S34-Bio-09- Collection of grey S “tadpoles”, “globules” or “Pele’s tears” picked from sediment suctioned for Bio-09 sample. All globules are hollow and have “popped”.

S34-Geo-10- Piece taken from edge of large slab of S crust overhanging large pit/fissure. Mostly pale grey but pale yellow areas too. Fine-grained matrix with embedded, grey S globules (all popped) and long S tails. Fragile. One larger piece (8 x 4 x 2 cm), and 6 smaller pieces.

Figure 4.1.1-4 S34-Bio-09 Sulfur tadpoles, globules and Pele's tears.

S34-Geo-12- Quenched, molten S encrusted on frame and instruments of *SuBastion*. We flew through smoky area with lots of S “tadpoles” flying in water around us. Could have been ejected up onto the ROV or slightly dipped in frame or both. Many pieces are very smooth and follow contours they are on. Others are thick with a rough surface of elongate strands in uniform direction. Mostly shiny, pale grey-green but with swirls of darker grey

and fewer patches of yellow. Some broken pieces show yellow inside. Largest piece is 15 x 9 x 9 cm, 6 medium pieces (6-12 cm) and one small piece with yellow.

Dive S36

Chamorro Seamount. Landed right at one small chimney with another visible in the background. Shimmering fluid with snails. Had to abort dive after sampling because of winds.

S36-Geo-01- Chimney was about 40 cm tall, white, and looked “blocky” with shimmering water coming from between “blocks”. Broke while sampling: 4 larger pieces (10- 16 cm), 10 medium pieces (~6 cm), 6 small (<4 cm). Sphalerite and barite-rich with drusy, green-grey pyrite in the conduit (maybe trace chalcopyrite?). Lots of crystals growing into void space, esp. barite, looking fuzzy. Many pieces have a thicker, white layer in the mid-wall, sometimes with larger laths= anhydrite? Inside is anastomosing channels, the largest is 2 cm wide and channels are particularly friable. The piece from the top of the orifice does not show any pyrite.

Dive S37

Alice Springs- Illium area. Landed right at an old, oxidized chimney stump. Sampled water from diffuse venting area then dive aborted because of hydraulic leak.

S37-Geo-01- Piece of highly oxidized chimney, 6 x 6 x 6 cm. Took a few days to dry out and very light. Dark orange to white and porous. Fe-oxides mainly.

Dive S40

Alice Springs- Burke area. Low-temperature, diffuse venting with lots of animals and other sites with milky plume but few animals. High-Fe and low-S? Searching for source of plumes detected by CTD but only diffuse flow and extinct chimney fields found.

S40-Bio-10- Rock collected for limpets from behind shimmering vent. 7.5 x 4.5 x 5 cm. Inside is dark basalt (although slightly spongy?). Outside is white alteration rim to a maximum of 14 mm thick. Orange Fe-staining between basalt and alteration, plus through rim. 2 other small pieces, one mostly altered, the other mostly not.

Dive S41

Hafa Adai vent field. Explored several sites: Two Towers (~16 m chimney super-structure); Sequoia (~30 m chimney super-structure); Chimlet Garden (smaller chimney field); Alba (smaller chimney field); Voodoo Crater (with diffuse venting and animals); and Waypoint 7 (a couple medium chimney clusters with less hydrothermal activity- no black smokers).

S41-Geo-01- Chimney fallen onto flange of Two Towers. Wine-bottle shaped and we got top 15cm, right to the base of the "neck" (base is 5cm wide, neck is 3cm). Looks like could see where it fell from just above. Fresh, no oxidation. Chalcopyrite-lined orifice at the top, 13mm diameter orifice. No distinct orifice at the bottom, but anastomosing cpy-lined channels. The outside is black except for small white patches.

S41-Geo-08 & 09- Outer pieces of bulbous, active chimneys on (lower?) flange area of Sequoia. Chimneys right beside each other and sampled into same box so can't distinguish between the samples. 10 pieces: two are 4-5 cm, three are 3 cm, five are <2 cm. Black/grey on the outside. Fine-grained cpy and other grey mineral inside. Sphalerite? Barite? Inside is very friable. One piece has larger-grained cpy with tiny vents <1 mm.

S41-Geo-11- Large, old chimney from Waypoint 7 vent area. Sticking up from top of small mound, inactive, 40 x 20 x 20 cm. Fragile parts have worn away and harder, cpy-enriched conduits remain, including two "spigots" sticking out from the base on one side. Whole thing is generally cylindrical with conical top, black with some orange and white patches. Top has 6 distinct vents, the central one lined by cpy and elongate (17 mm), not round. Other vents are grey mineral but with smaller cpy conduit inside. The base shows two larger conduits, 4-5 cm diameter, both cpy-lined up to 7 mm. Larger one is orange, Fe-oxide coated inside, and the smaller one is black inside.

Dive S42

Hafa Adai: Voodoo Crater, Sequoia, Waypoint 8 area.

S42-Geo-12- Sulfide rock collected for barnacles from Voodoo Crater. Thought it was lava from the "cinder" cone. 19 x 12 cm. One cpy-lined vent visible, 12 mm, otherwise massive, knobbly sulfide. Thin, black-brown oxidized layer outside and grey inside.

S42-Geo-13- Sulfide rock from outside NE flank of Voodoo Crater. Thought it was lava. 11 x 11 x 6 cm, heavy. Thin (<1mm) Fe-oxide coating on outside, but see py/cpy sulfide when break surface. Generally smooth surface.

S42-Geo-20- Chimney pieces from orange spire on top flange of Sequoia. Fell onto basket while sampling. 3 larger pieces fit together. One larger cpy-lined conduit with 5 mm orifice. Other conduits distinguishable larger-grained cpy lining. Outer rind zoned from orange exterior (<1 mm) to pyrite to brassy mineral to cpy inside. Inside is generally fine-grained cpy and other grey mineral, friable. Largest piece 13 x 11 x 10 cm, other pieces: 10 x 9 cm, 9 x 6 cm, 8 x 6 cm, 6 x 5 cm, and 5 smaller pieces.

S42-GTB-21- Chimney pieces that fell on R side of the basket while taking gas-tight sample, top flange of Sequoia. Had pushed R side of ROV into flange for stability. 3 pieces, one with distinct but poorly-lined orifice: 9 x 6 cm, 8.5 x 5 cm, 7 x 4 cm. Dark matrix and brassy, faint cpy with "sandy" texture. Narrow, anastomosing channels in the other pieces.

S42-Geo-22- Old sulfide crust from base of Sequoia. 16 x 9 cm. Orange on bottom (inside) and orange to black on top (outside). Outside layered with harder exterior, 1-2 mm, slightly overhanging eroded inner layers. Next layer is greenish-brown, clay-like texture, 3 mm, then dark interior. Some white staining between exterior and green-brown layer. Tube worm casings visible on outside. Where rind broken can see small, ~2 mm, cpy-lined conduits.

S42-Geo-23- Small, old chimney from Waypoint 8 vent area. 9.5 x 5 cm. Top is worn away in parts with 2 distinct, grey, orifices. Bottom has one orifice, cpy-lined with thin, oxidized coating in the conduit. Outside is black to white, and appeared blue when sampled (bacterial mat?). Very small orifices visible on the outside <0.5 mm.

Dive S43

Started N of Hafa Adai vent field looking at other, larger volcanic cone, then travelled S over sheet flows to Hafa Adai, Alba site, and ended at Sequoia.

S43-Geo-02- Highly oxidized chimney pieces N of Alba. Whole insides were mush. Chalky, orange crust, 4 mm thick. 2 larger pieces to 5 cm, 7 smaller pieces.

S43-Geo-08- Fresh, active chimney pieces from Alba. Collected with arm knocking into net. Largest piece, 8.5 x 6.5 cm and has 2 poorly-defined conduits at base, 2.5 cm and 8 mm. Also 2 small orifices at top but can't tell how connected to those at the base. Vents ~6 mm wide with 2 mm orifice. Inside is generally fine-grained cpy and other grey mineral, friable, with larger-grained cpy lining conduits. 4 smaller pieces with cpy-lined orifices, 2 partially whole, 2 with conduit exposed. Some cpy is brassy (slightly oxidized?). Another piece has pyrite on the outside instead of the usual black coating. One very small chimlet piece, 3 cm long, 9 mm wide with 3 mm orifice, cpy-lined. Another piece with distinct transition from black outer rind to inner cpy/py matrix inside. All together: 1 large, 6 med, 1 chimlet, 10 small pieces.

Dive S44

Hafa Adai vent field: Started at Waypoint 9 area to Waypoint 8, then to Two Towers and ended at Voodoo Crater.

S44-Geo-07- Active, high-temperature chimney pieces from top of Two Towers. Profuse black smoke and took fluid and gastight samples. 5.5 x 4.5, 6 x 3 cm. Cpy-lined conduit from <1 to 15 mm. Individual crystal faces up to 3 mm. Yellow cpy grades to orange and locally to purple and iridescent (bornite). Outer layer with pyrite and grey sphalerite. Outer rind ~1 mm Fe-oxides and orange to black.

S44-Geo-08- Sulfide piece from W flank of Voodoo Crater. 9 x 9 x 7 cm. Heavy. Oxidized exterior ~2 mm. Cpy and grey (sph?) inside where crust broken. Knobbly, no obvious vents. Exterior dark orange/brown with some bright green areas – secondary malachite? – in curvy lines. When dried, a chalky green coating on one side.

Dive S47

Perseverance vent field- Started among pillow lavas then traversed to Leaning Tower, Palisades, and Stump of Mystery vents.

S47-Bio-08- Piece of slightly older chimney from the flank of Stump of Mystery vent, collected for animals. 12 x 7 cm. Grey matrix with chaotic cpy-lining on one side. No obvious channels. Fe-oxide crust on the other side to 1 mm, orange to dark grey. Local, white sulfate patches but no crystals. Some whiter areas outside and on top – oxidized product? 1 small grey piece with minor cpy, 3 x 3 cm.

S47-Geo-13- Pieces of fresh chimney from the top of Stump of Mystery vent where fluids were sampled. 15 x 7 and 10.5 x 5 cm. Dark grey matrix (mostly sph?) interior with anastomosing channels and rough texture. Some minor cpy as greenish, and some thin cpy conduit linings, <1 mm visible locally. A few more well-defined orifices lined by larger sph hexagonal prisms. Local areas with barite and anhydrite, mostly concentrated towards the exterior. Larger laths/rosettes around some channels. Py and sph also close to exterior as slightly silvery. 1 small piece 3.5 x 3.5 cm, 50% sulfate, 50% sphalerite. Probably mostly anhydrite as not very heavy.

4.1.2 Rock Samples

Rock samples were collected by ROV *SuBastian* during *Falkor* cruise FK161129 primarily to characterize the lava chemistry at each of the visited Mariana back-arc segments. The sulfide samples that were collected are described in a separate section of this report. Two lava samples were collected at the Alice Spring vent field (dive S39) on the 18.2°N back-arc segment, three lava samples were collected in and around the Hafa Adai vent field, at the 17.0°N back-arc segment (dives S42, S43, and S44), and one lava sample was collected from the Perseverance Vent field (dive S48) on the 15.5°N back-arc segment. The rest of the lava samples were collected on or adjacent to one of the 2013-2015 lava flows (dive S45) on the 15.5°N back-arc segment (~7 km south of the Perseverance vent field). This includes 4 samples of the new (2013-2015) lava and two samples of the older surrounding lava flows. Photo graphs of all the FK161129 rock samples are available upon request.

SuBastian dive S45 on the 2013-2015 lavas started ~200 m south of where the *Okeanos Explorer's* Deep Discoverer dive D2-EX1605L1-DIVE09 ended. The *Okeanos* dive on 29 April 2016 was made on the northern-most and thickest of the 2013-2015 lava flows, and they also collected three rock samples from the 2013-2015 lava flows. Those samples:

D2-EX1605L1-DIVE09-SPEC01GEO

D2-EX1605L1-DIVE09-SPEC02GEO

D2-EX1605L1-DIVE09-SPEC03GEO

are archived at the Oregon State University Marine Geology Repository (osu-mgr.org).

The rock samples from FK161129 were sent to Ken Rubin at University of Hawaii. He plans to date the 2013-2015 lava flow samples using uranium series methods. Below is a “quick index” table of all the FK161129 rock samples (the “buckets” refer to how they were shipped to Rubin).

Table 4.1.1-1 Rock Sample Quick Index

Sample Name	Type	Location
S39-Bio-15	Crust of pillow basalt	Alice Springs- Alice Springs
S42-Geo-14	Sheet lava crust	Hafa Adai- between Voodoo & Sequoia
S43-Geo-01	Sheet lava crust	N of Hafa Adai
S44-Geo-01	Large sheet lava crust	Hafa Adai- S of Waypoint 9
S45-Geo-01	Pillow basalt crust	Perseverance- North
S45-Geo-02	Pillow basalt	Perseverance- North
S45-Geo-03	Pillow basalt	Perseverance- North
S45-Geo-04	Pillow basalt	Perseverance- North
S45-Geo-05	Older pillow basalt	Perseverance- North
S45-Geo-06	Older pillow basalt	Perseverance- North
S48-Geo-01	Pillow basalt	Perseverance

Rock Sample descriptions:

Dive S39

Alice Springs Vent Field - Alice Springs vent area (18.2°N back-arc segment). Lots of anemone, snail, crab, shrimp, etc. areas with diffuse venting to 30°C, and milky plume.

S39-Geo-11- Rock collected from marker 131 site for barnacles. 21 x 11 x 11 cm. Piece of pillow basalt.

S39-Bio-15- Rock collected from top of sulfide swath up the slope for small anemones on it. Crust of a pillow basalt with glassy rim on one side. Lightly altered inside.

Dive 42

Hafa Adai Vent Field (17.0°N back-arc segment): Voodoo Crater, Sequoia, Waypoint 8 area.

S42-Geo-14- Sheet lava between Voodoo Crater and Sequoia. 14 x 14 x 9 cm. Half-cylinder shape. Ropy, bark-like texture on the outside and brown to black, some glassy rind. Swirled, Fe-oxide staining on the inside with vesicle/bubble rim 5 x 6 cm. Cross-section vesicles flattened, up to 2 cm wide and 3+ cm long. Outer layer almost split from inner layer and fold-back feature?

Dive 43

Started N of Hafa Adai Vent Field (17.0°N back-arc segment) looking at other, larger cone, then travelled S over sheet flows to Hafa Adai, Alba vent site, and ended at Sequoia vent.

S43-Geo-01- Sheet lava crust from N of Hafa Adai. 16.5 x 15.5 cm. Black and sharp, ropy, bark-like texture on top. Large bubble rim on bottom 11.5+ x 5 cm, with other, smaller bubble features around. Vesicles in cross-section flattened, up to 15 mm wide.

Dive 44

Hafa Adai Vent Field (17.0°N back-arc segment): Started at Waypoint 9 area to Waypoint 8, then to Two Towers and ended at Voodoo Crater.

S44-Geo-01- 3 pieces of large sheet lava from S of Waypoint 9. 27 x 19, 14 x 6, 7 x 4 cm. Ropy, bark-like on top, either smooth, bubble imprints or rough on bottom. Black, somewhat glassy. Cross section vesicles maximum 13 x 25 mm, but most are a couple of mm.

Dive 45

Dive on the new pillow lava flows at the 2013-2015 lava flow site (15.5°N back-arc segment) ~7 km south of Perseverance Vent Field. Dive sampled both the new lavas (01-04) and the surrounding older lavas (only west of the new flow).



Figure 4.1.1-5 S45-Geo-01 basalt crust.

S45-Geo-01- Piece of basalt crust from “exploded” pillow. Arcuate. 13 x 13 cm. Top is rough and wavy, glassy underneath. Lava is black with plag up to 7 mm. Few vesicles to 16 mm, otherwise not vesicular. Bottom is larger pieces of concave glass rims fused together. “New” 2013-2015 lava.

S45-Geo-02- Cylindrical piece of pillow lava, 9 x 13 cm. Outside is glassy rim to 4 mm. Inside with radiating breakage fractures. Plag to 3 mm. Hardly any vesicles. “New” 2013-2015 lava.

S45-Geo-03- 4 pieces of pillow basalt, largest is 8 x 6 cm. All have glassy rim on 2 sides – top and bottom. Plag to 4 mm, hardly any vesicles. Some glass on the bottom side is arcuate with smooth, brown surface like outlining bubble. “New” 2013-2015 lava.



Figure 4.1.1-6 S45-Geo-04 pillow basalt.

S45-Geo-04- Large cylindrical piece of pillow basalt. 10 x 21 cm. One of the tubes is more flattened. Glassy rim to 10 mm. Plag to 4 mm. Hardly any vesicles. “New” 2013-2015 lava.

S45-Geo-05- Triangular piece of older pillow basalt, 8 x 7.5 cm. Thin glass on top to 2 mm. Plag to 4 mm. More phenocrysts than newer lava. Glassy, rough, jagged, brown rim on the bottom. Hardly any vesicles. Older lava from flows at margin of 2013-2015 lava flow.

S45-Geo-06- 3 pieces of older pillow basalt. 2 triangular ~10 x 13 cm, 1 elongate 16 x 5 cm. Glassy rims to 5 mm, turning brown. Lava brown on the outside. Plag to 5 mm (triangular) or 3 mm (elongate). Triangular pieces slightly more vesicular, to 3 mm. Older lava from flows at margin of 2013-2015 lava flow.

Dive 48

Looking around Perseverance Vent Field (15.5°N back-arc segment) for more sources of plume signal. Got one piece of lava from bottom of hill by chimneys. Aborted early because of ROV oil-comp problems.

S48-Geo-01- Cylindrical piece of pillow basalt, 15 x 8 cm. Glassy rim to 6 mm. Plag to 5 mm and mostly in glass. Not very vesicular except a few up to 10 mm.

4.2 Hydrothermal Chemistry

4.2.1 Hydrothermal Fluid Chemistry

Dave Butterfield

Our primary goals for chemistry were to collect samples to characterize high-temperature fluids from each vent site in order to understand conditions in the reaction zone of each vent site, including the influence of high-temperature water-rock equilibrium and input of magmatic gases. We will use the chemistry data to relate the fluids to the mineralogy of the chimney deposits. It was equally important to characterize in some detail the temperature and chemical conditions in diverse vent fauna habitats in order to evaluate potential systematic differences in the chemical environment between arc and back-arc sites. The primary tool for both of these goals (and also for the microbiology of diffuse fluids) was the Hydrothermal Fluid and Particle Sampler (HFPS, a.k.a. the Beast), using a combination of titanium or PVC pistons and Tedlar collapsible bags. HFPS also collected large volume samples and preserved DNA/RNA with in-situ filtration. In addition to HFPS, we had titanium major samplers on board as a backup, but we never used a major sampler with the ROV. To enable quantitative collection and analysis of gases, we also had 10 pre-evacuated titanium gas-tight samplers (UCSB type) from John Lupton and Marv Lilley.

HFPS Setup

In an effort to improve reliability while replacing worn parts, the HFPS was again modified prior to this expedition, and we will briefly document the changes here. We had been using stainless steel multi-port quick disconnect (QD) fittings from Beswick Engineering for 10 years with variable success. They were difficult to maintain and not designed to work well under negative internal pressure (i.e. suction to pull water into samplers). We therefore switched to plastic QD fittings (Colder Products) with O-ring/piston seals, designed to work under suction and to be easier to maintain or replace (at 1/10 the cost of the stainless parts). Testing of these parts in the lab gave excellent results.

A second major change was in the piston sampler design. To reduce the friction, improve piston alignment, and increase reliability, we designed a double-seal piston with a guide extension to keep the piston straight in the cylinder. These also tested extremely well in the lab. The force needed to move the pistons through the cylinders was significantly less and they did not leak under pressure.

A third change was in the collapsible sample bag valve. We have used a Luer-locking valve manufactured by PMC (small company, maker of the collapsible bags) for many years, but there were severe quality issues with the valves, requiring pre-testing of valves before they were assembled on the bags. Both PMC and another company offer a side-stem/septum valve that seals very reliably. We adapted our plumbing to attach the valve stem to the lid of the bag samplers (using a short length of tubing and a hose-barb-to-Luer adapter). Although the valve function works extremely reliably, the seal of the valve base onto the bag is not as robust and reliable as desired because the new valve sealing area is narrow/small, so it requires delicate handling during cleaning, setup, and processing. We found that the bags were reliable with careful handling, but we did lose a few samples due to leaking around the valve base where it seals to the bag.

We installed a new temperature sensor in the intake nozzle during mobe in Guam.

The physical layout of the HFPS on the ROV was separated into two parts, one starboard and one port on the aft of the vehicle approximately 4 feet above deck level. This arrangement made it very easy to work on the sampler on deck. New tubing and connectors were installed to go between the 25-port valve and the sampler racks. We used the same thick-walled polyurethane tubing as in previous setups, although the tubing between valve and racks was approximately twice as long in the setup for *SuBastian* (approximately 4-foot tubing length). We covered the instrument with perforated plastic sheet (1/4" thick) to protect the plumbing and parts from ROV thruster wash. (The mounting location is close to thrusters). The ROV group made an aluminum frame to hold the top cover. The electrical cable for the (newly installed) temperature sensor in the nozzle was routed to the front of the vehicle and attached to the fluid intake hose. The intake hose and temperature cable were covered with thick, blue insulating tubing (from the ROV group) to protect them from heat and abrasion. We provided an aluminum pipe with a flared opening and base clamp for a nozzle holster attached to the

forward starboard corner of the ROV porch. The cable and hose formed a large S shape held by bungee cords attached to the ROV to allow extension and retraction during sampling.

The sampling performance of HFPS was disappointing. A large number of piston and bag samples came up empty, indicating a failure in plumbing. In a few cases, operator setup errors (primarily loose fittings) resulted in leaks that explained the failed samples, but in most of the cases there was no obvious reason for failure. We conducted multiple tests of the plumbing connections, pumps, and valve on deck, but did not find an explanation there either. Suspecting the new QD fittings, we removed one of them and plumbed the lines directly from the valve to the samplers (making manual connections on each sampler). Some of the direct connections also failed with no explanation, so the QD fitting is not the cause. It will take additional testing in the lab to determine the cause of the failed samples. In spite of the poor sampler performance, we collected 52 successful fluid chemistry samples, and we can characterize the chemistry of every vent field. This is a very successful sample return; it just doesn't measure up to what HFPS can do when everything works perfectly. The in-situ sensors add significant data to fill out the picture of how temperature and chemistry vary within diffuse flow areas at each vent field.

Apparently the Schilling Titan arms used on *SuBastian* are significantly more powerful than those used on other ROVs. Our intake nozzle, which has survived more than 100 ROV dives, was almost destroyed. The T-handle was bent, the top plate with hockey puck grip was broken off, and the main shaft (made of $\frac{3}{4}$ " titanium pipe) was bent. Fortunately, the temperature probe was spared and we did not need to replace it during the cruise.

Sampling

Table 4.2.1-1 lists all of the fluid chemistry samples attempted during the expedition, with gas-tights at the top of the table. The metadata information in this table was extracted from the IRLS ROV dive log. Table 4.2.1-2 shows the sample processing for the fluid chemistry samples taken with HFPS. We recovered 52 successful samples for fluid chemistry, listed in Table 4.2.1-2.

Between uses, samplers were cleaned with hot water. Surfaces were wiped clean with a Kim Wipe wetted with ethanol, then rinsed again with de-ionized water, then rinsed with filtered deep seawater collected the previous year from the Mariana back-arc. Filtered deep seawater was used to fill dead volumes of the samplers. The HFPS intake hose, nozzle, and manifold were rinsed with fresh water after each dive, then thoroughly rinsed with seawater during descent. The manifold was rinsed with seawater between sampling sites. Additional deep seawater was collected with Niskin samplers late in the cruise, then filtered through a 0.2 micron filter cartridge and stored in an acid-cleaned Nalgene carboy.

Sample processing and shipboard chemistry

Upon ROV recovery, sample trays were removed from the HFPS and taken into the lab. There was insufficient refrigerator space (only one lab refrigerator on the ship) to store whole sample trays, so piston samples were removed and placed on foam 'eggshell' padding in the refrigerator to await processing. Bag sampler cylinders were stored in the refrigerator with inlets plugged until they could be processed. Bags were removed from their cylinders, weighed on a pan balance to determine volume, sub-sampled for hydrogen and methane analysis by GC and hydrogen sulfide analysis by spectrophotometric molybdate blue method. All sub-sampling was done without exposure of the sample to air. If gas headspace was present in the sample, it was completely removed into one container and the volume of gas and remaining liquid was measured; both phases were analyzed by GC. Samples for pH were stored in 30-ml bottles, filled from the bottom with an extension tube on a syringe to minimize gas exchange and measured at room temperature with a glass pH electrode calibrated with NBS buffers. After pH analysis, a 15-ml aliquot was measured and titrated for alkalinity using a Metrohm Titrino automated titrator with Brinkmann pH electrode and Gran-function endpoint determination. Samples for dissolved silicate analysis were diluted in 0.02N HCl and analyzed by silicomolybdate blue spectrophotometry on board. (Samples from the last dive had to be diluted and brought back to the shore lab for analysis due to the time constraints of offloading). Approximately half of the samples taken were filtered in-situ through 0.4 micron pore size polycarbonate membrane filters that were acid-washed, rinsed, dried, and weighed prior to the cruise. Samples that were filtered in-situ on HFPS were not filtered again during processing. An aliquot for nutrient analysis was syringe filtered into an acid-cleaned HDPE bottle, acidified to pH ~3 with ultra-pure HCl, purged with a nitrogen gas stream to remove H₂S, then frozen. Frozen samples were shipped back by air to Seattle. Samples for major ions were syringe

filtered and stored in acid-cleaned 30ml HDPE bottles. Samples for trace metals were transferred to 250ml or 500ml I-Chem clean HDPE bottles and acidified to pH <2 with ultrapure HCl. Samples for DOC analysis were syringe filtered (after the nutrient sample, using the syringe and filter rinsed with sample by the nutrient cut) and frozen in glass containers that were rinsed and heated to 550°C for 8 hours in a muffle furnace then wrapped in clean aluminum foil prior to the cruise. Selected samples for sulfur isotope analysis were transferred to 40-ml glass vials from a syringe with an extension tube (as for pH), 0.5ml of 10% Cd acetate solution was added, vials capped and taped. Selected samples for microbiology (cell counts, single cell genomics, other) were transferred to Falcon tubes or stored in sterile syringes and given to Julie Huber for preservation.

Sensors

HFPS was equipped with a SeaBird (Bellevue, WA) SBE 63 oxygen optode and a deep-sea pH sensor (glass electrode, pressure-compensated, AMT Rostock, Germany). Both sensors were calibrated by the manufacturers in 2016 prior to the expedition. The oxygen optode was rinsed with water between ROV dives. The pH sensor was rinsed with water and stored in 3M KCl solution in a protective storage cap between dives. The pH calibration was checked through the HFPS electronics with NBS buffers on Dec 5 and Dec 18. Sensor performance was consistent through the cruise. Sensor values reported in the ROV log during the first week of the cruise were incorrect due to incorrect calibration constants in the HFPS software. All sensor data will be reprocessed on shore from the HFPS log files. Along with the in-line temperature sensors, the pH and oxygen sensors were used frequently to measure in-situ properties of diffuse vent areas. We recorded approximately 60 spot measurements with the sensors during the cruise. We also recorded vertical profiles of pH and oxygen during ascent or descent (although rarely the entire vertical profile through >3000 meters), and we use these profiles in comparison with the ROV-mounted oxygen sensor or background CTD profiles to evaluate oxygen sensor performance. Generally, both sensors appeared to give consistently good data for the duration of the cruise.

Gas-tight samplers

The gas-tight samplers were evacuated and sealed before the cruise in the Lupton lab. Samplers were set up with snorkel inlets rinsed and filled with deep seawater before they were deployed. Using the gas-tight samplers was one of the more difficult operations for the ROV. The hydraulic trigger ram was mounted on the port manipulator. The design of the ROV makes it difficult to pick up a gas-tight sampler from the front of the porch, and maneuvering the gas-tight into position when the ROV was up close against a chimney was also very difficult. It was our priority to take high-temperature samples from the back-arc sites. We collected 1 gas-tight from Alice Springs, 4 from Hafa Adai 17°N, and 2 from Perseverance 15.5°N. The number of samples collected is small, but we took care with the sampling setup and the quality of many of them appeared to be quite good. Each sampler was labeled after use with the dive location on the sampler body. Samplers were shipped back to Seattle in the container and then forwarded to Newport, Oregon for extraction and analysis in the Lupton lab. We worked with the ROV engineers in the year before the expedition to get the hydraulic trigger ram mounted on the manipulator arm. The ROV team designed a mounting bracket that is easy to adjust and it worked perfectly. It was a good fit for the major sampler syringes also, but space on the ROV porch was in high demand and we did not use them during the cruise.

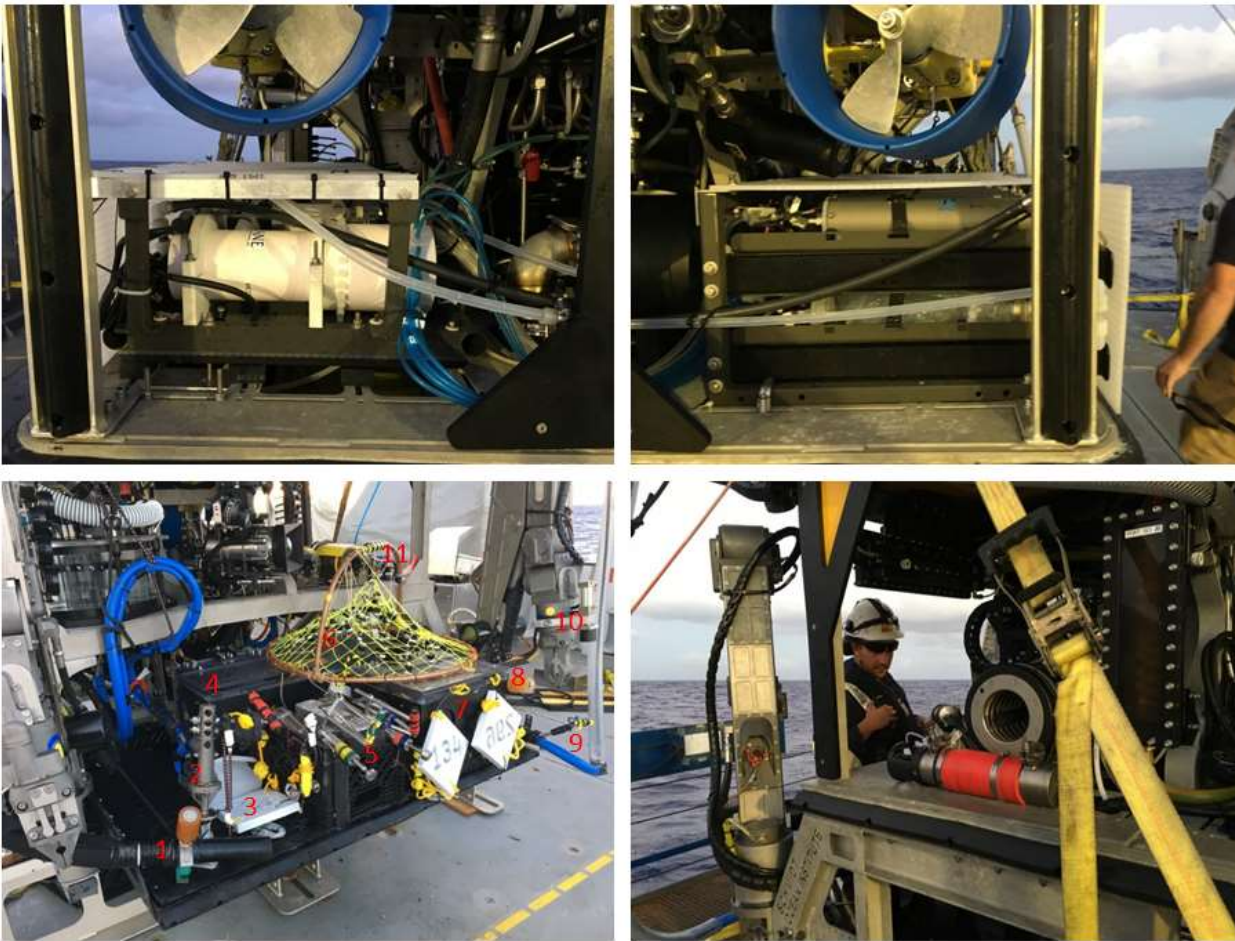


Figure 4.2.1-1. ROV science equipment on *SuBastian*. The ROV engineers left a large space for HFPS at mid-height under the aft thrusters. Top left shows aft view port side with HFS valve/pumps/controller/sensors. Top right is aft view starboard side showing the sampler trays and two hoses connecting the manifold to the flush pump line. Bottom right shows the MAPR (wrapped in red) mounted horizontally with sensors forward near the port forward corner of the ROV. Bottom left shows the front porch setup for dive 42. Equipment from left to right includes: 1) suction sampler intake with orange handle, 2) HFS intake nozzle in holster (after the ROV had broken the T handle and the top part of the nozzle), 3) white seafloor markers, 4) aft large biobox, 5) two gas-tights mounted in cradle made by ROV engineers, 6) 'Hula' temperature array made with copper tubing and net on top of 7) small biobox, 8) scoop tool mounted on side of biobox, 9) ROV temperature probe, 10) hydraulic trigger ram mounted on port arm, and 11) MAPR mounted to ROV and cabled for real-time data display. The two bottom photos show how the base of the manipulator arms are mounted close to the ROV body and within the lateral dimensions of the ROV frame to stay within A-frame constraints. This makes it difficult to use the manipulators close in to the vehicle due to physical interference of the frame and other components.

Table 4.2.1-1 Metadata for all ROV chemistry samples

Dive Number	Date Time (UTC)	Observation	Latitude	Longitude	Depth (m)	Heading	Type
39	12/6/16 05:14	S39-GTB-06 Fired. Yellow #9 GTB. In the hole with good verification of the wand tip in the pilot camera. Sample looked really good.	18.2104	144.7073	3611	312	Gas
41	12/8/16 02:20	S41-GTB-02 Red-green taken from the same orifice the 302deg fluid was measured with the ROV wand. From the west side of the chimney near the base but where the active venting began.	16.9611	144.8669	3274	84	Gas
42	12/9/16 05:58	S42-GTB-21 Fired when saw deflection in the black smoke. Tip moved when the ram was fired (moved away from orifice when it was fired). Same orifice as sampled with HFS.	16.9612	144.8670	3261	134	Gas
43	12/10/16 04:01	S43-GTB-07 Fired. In the black smoke in the smoker in the back of the small chimney in front. When fired saw the wand go further in the orifice. Same hole as the HFS samples here but at a slightly different angle.	16.9612	144.8678	3278	89	Gas
44	12/11/16 04:23	S44-GTB-06 Fired and saw it suck up in perfect position. In the same chimlet as the HFS samples. Good deflection of the flow.	16.9613	144.8666	3269	335	Gas
47	12/16/16 10:57	S47-GTB-09 Fired. Probe was down the hole at Stump of Mystery. Red Gastight #9. Taken from the top of the chimney in a hole that was excavated.	15.4801	144.5076	3907	313	Gas
49	12/18/16 03:08	S49-GTB-04 Fired. This was fired before the view of the bent ram. Saw the tip go into the chimney (not further into the hold) when fired. Questions raised if it actually fired so not logged at the time as a sample.	15.4801	144.5078	3907	317	Gas
34	12/1/16 22:46	S34-HFS-01 Started. Piston #1 in soft sediment surround by flatfish with low pH and 10deg above ambient temperature.	21.3251	144.1917	410	198	HFS
34	12/1/16 22:50	Stopped sample. Tmax=23.6 Tavg=13.5 T2=14 Vol=600 On volcanoclastic sediment with 10deg temperature anomaly at 10cm depth.	21.3251	144.1917	410	199	HFS
34	12/2/16 00:14	This is S34-HFS-04 titanium piston #2. Temperature is above 72deg. pH at this site was down to 4.1.	21.3251	144.1917	409	220	HFS
34	12/2/16 00:17	S34-HFS-05 Start Piston #3 at the exact same location as HFS-04.	21.3251	144.1917	409	220	HFS
34	12/2/16 00:29	S34-HFS-06 Start. DNA filter #13 for Julie Huber at the same location as the previous HFS samples.	21.3251	144.1917	409	219	HFS
34	12/2/16 00:46	Stop. Tmax=67.2 Tavg=59.9 vol=3002 T=35. Same site as pistons 2 & 3.	21.3251	144.1917	409	218	HFS
35	12/2/16 23:09	S35-HFS-01 Filtered Piston #1. PVC piston. In sediment next to black-tape fish trap. Start 23:09.	21.3251	144.1916	410	169	HFS
35	12/2/16 23:13	Stop 23:13. S35-HFS-01. Tmax=23.6 Tavg=19.1 vol=750 T2=15.	21.3251	144.1916	410	169	HFS
35	12/2/16 23:16	S35-HFS-02 Start 23:16 Unfiltered Bag #16. At exact same location as previous sample.	21.3251	144.1916	410	169	HFS
35	12/2/16 23:20	S35-HFS-02 Stop 23:20. Tmax=21.6 Tavg=20.9 vol=530 T2=15	21.3251	144.1916	410	169	HFS
35	12/2/16 23:21	S35-HFS-03 Start 23:21. RNA filter #14 at the same location.	21.3251	144.1916	410	169	HFS
35	12/2/16 23:23	S35-HFS-03. Temp going up to 28degC.	21.3251	144.1916	410	169	HFS

Dive Number	Date Time (UTC)	Observation	Latitude	Longitude	Depth (m)	Heading	Type
35	12/2/16 23:37	S35-HFS-03 Stop 23:37. Tmax=31.5 Tavg=29.8 vol=3000 T2=17. Exact same location as previous.	21.3251	144.1916	410	167	HFS
35	12/2/16 23:48	S35-HFS-05 Start 23:48. Filtered Bag #17. At exact same location.	21.3251	144.1916	410	167	HFS
35	12/2/16 23:51	S35-HFS-05 Stop 23:51. Tmax=28.6 Tavg=27.6 vol=400 T2=16 At same location.	21.3251	144.1916	410	166	HFS
35	12/3/16 00:05	S35-HFS-06 Start 00:05. Filtered Piston #3 with flush pump OFF. At same location. Other piston samples were taken with the flush pump ON.	21.3251	144.1916	410	166	HFS
35	12/3/16 01:19	S35-HFS-07 Start 01:19. Unfiltered Bag #18. In ambient temperature sediment approximately 30m east of the waypoint at Fish Spa. Can see exhaust.	21.3250	144.1919	407	145	HFS
35	12/3/16 01:24	S35-HFS-08 Start 01:24 Filtered Bag #19. At same location.	21.3250	144.1919	407	144	HFS
35	12/3/16 03:09	S35-HFS-11 Start 03:09. Unfiltered Bag #20. Taken at the same location as the tubeworm sample. In a crack at the base of the worms. Inside the crater wall.	21.3238	144.1923	355	139	HFS
35	12/3/16 05:49	S35-HFS-13 Start 05:49. Unfiltered Piston #4. At waypoint 1 site Fish Spa.	21.3251	144.1916	409	164	HFS
36	12/4/16 00:44	S36-HFS-02 Start 00:44. Filtered Piston #1. At the sulfide just sampled on the sulfide mound in the broken up lava flow.	20.8215	144.7071	920	40	HFS
36	12/4/16 00:47	S36-HFS-03 Unfiltered piston #2. Start 00:47. No exhaust. Exact same location.	20.8215	144.7071	920	40	HFS
36	12/4/16 00:50	S36-HFS-04 Start Unfiltered Bag #16. Can see exhaust with the bag sample. Flush pump is on. Same location.	20.8215	144.7071	920	40	HFS
37	12/5/16 02:19	S37-HFS-03 Start 02:19. Piston #2 Unfiltered titanium.	18.2134	144.7074	3583	323	HFS
37	12/5/16 02:30	S37-HFS-04 Start 02:30 Unfiltered bag #16. Visible exhaust flow.	18.2134	144.7080	3583	323	HFS
37	12/5/16 02:39	S37-HFS-06 Start 02:39. LVB #24. Seeing some bubbles and fresh water from exhaust. Same location.	18.2138	144.7071	3583	323	HFS
37	12/5/16 03:07	S37-HFS-07 Start. Unfiltered bag #18. Same location in robosnail patch.	18.2143	144.7073	3583	323	HFS
37	12/5/16 03:14	S37-HFS-08 Start 03:14. Filtered DNA #11.	18.2136	144.7074	3582	323	HFS
37	12/5/16 03:29	S37-HFS-09 Unfiltered piston #8. Start 03:29. Same location.	18.2135	144.7077	3582	323	HFS
37	12/5/16 03:58	S37-HFS-11 Background sample. Unfiltered Bag #20. At the robosnail site. Not seeing any flow.	18.2138	144.7071	3582	323	HFS
37	12/5/16 04:12	S37-HFS-15 Start 04:12. Filtered Piston #3. Background.	18.2137	144.7075	3582	323	HFS
39	12/6/16 03:40	S39-HFS-01 Start 03:40. Unfiltered Piston #2. Have good flow.	18.2101	144.7074	3626	348	HFS
39	12/6/16 04:24	S39-HFS-02 Start 04:24. Filtered Piston #1. At the focused flow at the nav marker snail-001 site where the ROV had a high temperature of 158deg.	18.2104	144.7072	3611	307	HFS
39	12/6/16 04:37	S39-HFS-04 Start 04:37. Filtered Piston #7. At same location snail-001 near the robosnail deployment.	18.2102	144.7074	3611	307	HFS
39	12/6/16 04:39	S39-HFS-05 Start 04:39. Filtered Piston #3. Looks like it is working.	18.2102	144.7075	3611	307	HFS
39	12/6/16 06:11	S39-HFS-07 Start 06:11. LVB #24 Temperature started at about 44-45deg.	18.2103	144.7073	3611	237	HFS

Dive Number	Date Time (UTC)	Observation	Latitude	Longitude	Depth (m)	Heading	Type
39	12/6/16 06:37	S39-HFS-08 Start 06:37. Unfiltered Piston #4 At the same location as the LVB. Near the crack with the 2 snails.	18.2103	144.7074	3611	234	HFS
39	12/6/16 06:43	S39-HFS-09 Start 06:43. Unfiltered Bag #20. Same exact location as the last one.	18.2103	144.7074	3611	234	HFS
39	12/6/16 06:49	S39-HFS-10 Start 06:49. DNA Filter #10. Same exact location.	18.2104	144.7075	3611	234	HFS
39	12/6/16 10:22	background seawater 925m during ascent see flow out exhaust Tmax=4.6 Tavg=4.3 Vol=500	18.2104	144.7080	969	295	HFS
40	12/7/16 02:38	S40-HFS-05 Start 02:38. Filtered Piston #1. At the exact location of the last sensor reading just a few inches to the right of the robosnail. Not seeing exhaust flow.	18.1825	144.7199	3630	2	HFS
40	12/7/16 02:43	S40-HFS-06 Start 02:43 Unfiltered Piston #2. Not seeing any flow. Same exact location.	18.1826	144.7198	3630	2	HFS
40	12/7/16 02:52	Stop. Tmax=42.2 Tavg=39.4 vol=400 T2=16.	18.1826	144.7199	3631	2	HFS
40	12/7/16 02:53	S40-HFS-08 Start 02:53. Filtered Bag #21. Can see flow/exhaust. Same location.	18.1826	144.7199	3631	2	HFS
40	12/7/16 03:24	S40-HFS-10 Start 03:24. RNA Filter #11 At the same location.	18.1825	144.7198	3631	2	HFS
40	12/7/16 03:54	S40-HFS-11 Start 03:54. Unfiltered Piston #8 Seeing good exhaust. Same location to the right of the robosnail.	18.1825	144.7199	3631	2	HFS
40	12/7/16 04:26	S40-HFS-14 Start 04:26 Unfiltered Bag #20	18.1824	144.7200	3629	172	HFS
40	12/7/16 04:30	S40-HFS-15 Start 04:30. Filtered Bag #19. Same location in the milky flow as #20.	18.1825	144.7200	3629	172	HFS
41	12/8/16 03:28	S41-HFS-06 Start 03:28 Unfiltered piston #8. With good flow. Tip is in the minerals.	16.9611	144.8670	3274	136	HFS
41	12/8/16 03:34	S41-HFS-07 Start 03:34 Filtered Piston #3 at the same exact location as the unfiltered piston. Good exhaust.	16.9611	144.8670	3274	136	HFS
42	12/8/16 23:40	S42-HFS-01 Start 23:40. Unfiltered Bag #22	16.9617	144.8692	3278	3	HFS
42	12/9/16 00:22	Stop Tmax=124 Tavg=120 vol=650 T2=40.	16.9617	144.8692	3278	359	HFS
42	12/9/16 00:24	S42-HFS-04 Start 00:24 Filtered Piston #3 Same location as reading #8 inside the temperature array near Mkr-171.	16.9617	144.8692	3278	359	HFS
42	12/9/16 00:31	S42-HFS-05 Start 00:31. LVB #24 at location #8 in the array. Brought wand up from hot water just sampled at same exact location a few inches to get cooler water.	16.9617	144.8692	3278	359	HFS
42	12/9/16 00:55	S42-HFS-06 Start 00:55 RNA filter #10 At location #8 (of array readings) inside the temperature array near Mkr-171. Same exact location as HFS-05.	16.9617	144.8692	3278	353	HFS
42	12/9/16 01:35	S42-HFS-07 Start 01:35 Unfiltered Bag#20. Location near the edge of the array near the last reading but after the vehicle was bumped.	16.9617	144.8692	3278	350	HFS
42	12/9/16 01:39	S42-HFS-08 Start 01:39 Filtered Bag #19 Same location as HFS-07 near Location #9 in the array at Mkr-171 (started a bit later as valve needed to move).	16.9618	144.8692	3278	350	HFS

Dive Number	Date Time (UTC)	Observation	Latitude	Longitude	Depth (m)	Heading	Type
42	12/9/16 04:09	S42-HFS-15 Start 04:09 On the NE side of Sequoia at 25m altitude (about 6m from the top). Unfiltered Piston #2 In the black smoke after breaking off about an inch of this chimney.	16.9612	144.8670	3261	219	HFS
42	12/9/16 04:15	S42-HFS-16 Start or:15 Filtered Piston #5. Same location as HFS-15 and looks like tip has not moved.	16.9612	144.8670	3261	219	HFS
42	12/9/16 04:38	S42-HFS-17 Start 04:38 Unfiltered Piston #8 Same exact location with slight movement to get the hottest water.	16.9612	144.8670	3261	219	HFS
42	12/9/16 04:45	S42-HFS-18. Start 04:45 Unfiltered Piston #6 Same exact location with a bit higher temperature.	16.9612	144.8670	3261	218	HFS
42	12/9/16 04:51	S42-HFS-19 Start 04:51. Unfiltered Piston #4. Same exact location.	16.9612	144.8670	3261	218	HFS
43	12/10/16 02:45	S43-HFS-04 Start 02:45. Filtered Piston #1. Seeing some flow in the exhaust but not strong. Vent that was excavated slightly.	16.9613	144.8679	3277	88	HFS
43	12/10/16 02:53	S43-HFS-05 Start 02:53 Unfiltered Piston #2. Same location as HFS-04 on the lower part of Alba Vent. Running the flush pump on this one. Can see some exhaust flow.	16.9613	144.8679	3277	87	HFS
43	12/10/16 03:04	S43-HFS-06 Start 03:04 Filtered Piston #3 Same exact location as the last two samples.	16.9613	144.8679	3277	86	HFS
43	12/10/16 04:54	S43-HFS-10 Start 04:54 RNA Filter #10 Same location as LVB HFS-09.	16.9612	144.8679	3277	96	HFS
43	12/10/16 05:24	S43-HFS-11 Start 05:24 Unfiltered Bag #22 At the same site as the LVB sample on Alba Vent.	16.9613	144.8679	3277	93	HFS
43	12/10/16 05:28	S43-HFS-12 Start 05:28 Filtered Bag #21. Same exact location as HFS-13 and LVB.	16.9613	144.8678	3277	94	HFS
43	12/10/16 05:31	S42-HFS-13 Start 05:31 Unfiltered Bag #20 Same exact location as LVB and previous HFS sample.	16.9613	144.8678	3277	93	HFS
44	12/11/16 02:11	Unfiltered Piston #2 with good exhaust. Near Waypoint #9 20m Mami wata Vent (Water goddess)	16.9608	144.8720	3285	137	HFS
44	12/11/16 02:19	Stop Tmax=13.3 Tavg=7.6 vol=393 ml T2=5.	16.9608	144.8720	3285	139	HFS
44	12/11/16 03:54	Filtered Piston #1. Right in the black smoke at the top of Two Towers. Great location. Can see exhaust.	16.9613	144.8665	3269	349	HFS
44	12/11/16 04:05	Unfiltered Piston #3 At the top of Two Towers same chimney at the first sample.	16.9613	144.8665	3269	347	HFS
44	12/11/16 04:10	S44-HFS-05 Temp is stable at 345ish. Still at the same chimney with great placement.	16.9613	144.8665	3269	343	HFS
44	12/11/16 04:14	Stop. Tmax=348. Tavg=346.7 vol=601 T2=74.	16.9613	144.8666	3269	346	HFS
44	12/11/16 05:41	S44-HFS-09 Start 05:41. Unfiltered Piston #5 at recorder #6 inside the array at Voodoo. Not seeing good flow on this one in the exhaust.	16.9618	144.8692	3278	85	HFS
44	12/11/16 05:45	S44-HFS-10 Start 05:45. Unfiltered Piston #6 Same exact location. Not seeing exhaust again.	16.9617	144.8692	3278	85	HFS
44	12/11/16 05:52	S44-HFS-11 Start 05:52. Filtered Bag #19. Getting good exhaust.	16.9618	144.8692	3278	85	HFS

Dive Number	Date Time (UTC)	Observation	Latitude	Longitude	Depth (m)	Heading	Type
44	12/11/16 05:57	S44-HFS-12 LVB #24 Near recorder 6 in the Hula array at the same location as the last samples.	16.9618	144.8692	3278	85	HFS
44	12/11/16 06:22	S44-HFS-13 DNA Filter #10 Same location as LVB and previous water samples in the Hula array.	16.9618	144.8692	3278	86	HFS
44	12/11/16 06:49	Start 06:49 Filtered Bag #16 At the same exact location in the Hula array.	16.9617	144.8692	3278	86	HFS
44	12/11/16 07:48	Start 07:48. Unfiltered Piston #8. In the maximum heat area under the hula array after the array was lifted.	16.9618	144.8692	3278	81	HFS
44	12/11/16 07:55	Start 07:55 Unfiltered Piston #7. Same place in the high-T flow.	16.9617	144.8692	3278	79	HFS
44	12/11/16 08:00	S44-HFS-19 Start 08:00 .Filtered bag #17. Good exhaust.	16.9617	144.8692	3278	79	HFS
47	12/16/16 07:39	S47-HFS-01 Start Unfiltered Bag #16. Believe we are close to waypoint 7 but big bathy offset and will have to determine this later.	15.4799	144.5076	3913	11	HFS
47	12/16/16 07:43	S47-HFS-02 Start. Filtered Piston #1 Not good exhaust. Start/stop pump. Same exact location as HFS-01	15.4799	144.5076	3913	11	HFS
47	12/16/16 07:50	S47-HFS-03. Start 07:50 Unfiltered Piston #2. Not seeing exhaust.	15.4799	144.5076	3913	11	HFS
47	12/16/16 07:53	S47-HFS-04 Start 07:53 Filtered Bag #17 Good flow.	15.4799	144.5076	3913	11	HFS
47	12/16/16 08:32	S47-HFS-06 Start 08:32 DNA Filter #10. At the same exact location as the previous sample.	15.4799	144.5076	3913	10	HFS
47	12/16/16 11:12	S47-HFS-10 Start 11:12. Unfiltered Piston #8. Can see exhaust. Good one.	15.4801	144.5076	3907	313	HFS
47	12/16/16 11:17	S47-HFS-11 Start 11:17. Filtered Piston #7. Can see exhaust. Same exact location as HFS-10 at Stump of Mystery.	15.4802	144.5077	3907	313	HFS
47	12/16/16 11:22	S47-HFS-12 Start 11:22. Unfiltered Piston #6 at same exact location on Stump of Mystery.	15.4802	144.5077	3907	313	HFS
49	12/18/16 00:29	S49-HFS-01. Start 00:29 RNA Filter #11 Background water sample after almost reaching the bottom and dive being canceled.	15.4801	144.5073	3664	53	HFS
49	12/18/16 01:09	Unfiltered Bag #16. Another background water sample while ascending.	15.4795	144.5070	2558	263	HFS
49	12/18/16 01:12	S49-HFS-03 01:12 Background water sample. pH values seem to be low today and probably need to recalibrate. pH=7.15 in the deep water (had been 7.5).	15.4795	144.5070	2433	262	HFS
49	12/18/16 04:22	S49-HFS-08 Start 04:22 Filtered Bag #18 At the same location as last sample at Limpet's Canyon.	15.4798	144.5076	3913	41	HFS
49	12/18/16 04:26	S49-HFS-09 Start 04:26 LVB #24 At same location.	15.4800	144.5077	3913	41	HFS
49	12/18/16 04:57	Start Unfiltered Bag #20 At the same location at Limpet Canyon after the RNA filter.	15.4799	144.5077	3913	44	HFS
49	12/18/16 05:18	S49-HFS-12 Start 05:18 Filtered Piston #3 Taken at the top of Stump of Mystery but not in the hottest water. Not working Aborted.	15.4802	144.5077	3906	346	HFS
49	12/18/16 05:19	S49-HFS-13 Start 05:19. Unfiltered Piston #4. Can see exhaust. Good example at the top but not hottest water at Stump.	15.4802	144.5077	3906	346	HFS

Table 4.2.1-2 Vent Chemistry Sample Splitting Information

SuBastian Sample#	lab sample#	Tmax °C	Sample volume mL	gas head mL	gas-H2O mL	pH/Alk mL	H2S/Si mL	Nutrients	DOC mL	Majors mL	TM mL	Microbio	S isotope
S34	<i>Daikoku</i>												
S34-HFS-01	S34-P1	13.1	303	0	23	35	30	45	35	35	100		
S35	<i>Daikoku</i>												
S35-HFS-01	S35-PF1	23.6	270	44	15	35	25	30	45	30	70		20
S35-HFS-06	S35-PF3	28.2	120	87	15	35	20			20	30		
S35-HFS-07	S35-B18	13.5	254		22	35	25	42	35	35	60		
S35-HFS-08	S35-BF19	13.6	111		12	4	20	30	15	20	10		
S35-HFS-11	S35-B20	15.7	200	3	15	35	30	35		35	50		
S35-HFS-13	S35-P4	42.3	130	98	15		15		30	35	35		
S36	<i>Chamorro</i>												
S36-HFS-04	S36-B16	139	210	0	32	35	30	50		35	30		
S36-HFS-05	S36-B18	155	200	14	22	35	30	20		30	60		
S37	<i>18N Illium</i>												
S37-HFS-09	S37-P8	32.8	750		30	35	30	42	75	35	500		
S39	<i>18N Alice Springs</i>												
S39-HFS-01	S39-P2	7.8	722		33	35	35	45	45	35	350	50	
S39-HFS-02	S39-P1	126.5	575		25	35	35	45		35	400		
S39-HFS-03	S39-P8	161.4	745		35	35	30	45	40	35	470		45
S39-HFS-05	S39-PF3	164.8	732		22	35	35	45	45	35	470		45
S39-HFS-07	S39-LVB24	67.7	3000										
S39-HFS-08	S39-P4	33.4	616		23	35	30	45	45	35	350	53	
S39-HFS-09	S39-B20	40.5	414	60	24	35	25	45		35	250		
S39-HFS-16	S39-B16	4.6	506	0	22	35	40	45	40	35	220		
S40	<i>18N Burke</i>												
S40-HFS-07	S40-B22	42.2	466	0	22	35	25	40	40	35	220	47	
S40-HFS-08	S40-BF21	47.2	402	0	22	35	25	45	40	35	200		
S40-HFS-09	S40-LVB24	49.5											
S40-HFS-11	S40-P8	48.7	722	0	22	35	25	45	40	35	475	45	
S40-HFS-14	S40-B20	11	464		32	35	25	40	40	35	210	45	

SuBastian Sample#	lab sample#	Tmax °C	Sample volume mL	gas head mL	gas-H2O mL	pH/Alk mL	H2S/Si mL	Nutrients	DOC mL	Majors mL	TM mL	Microbio	S isotope
S40-HFS-15	S40-BF19	11.1	225	0	22	35	25	40		35	70		
S41	<i>Hafa Adai</i>												
S41-HFS-06	S41-P8	302	700		20	35	30	45	40	35	450		45
S41-HFS-07	S41-PF3		462		22	35	30	45		35	250		45
S42	<i>Hafa Adai</i>												
S42-HFS-01	S42-B22	25.6	307		not run	32	25			30	100	120	
S42-HFS-02	S42-BF21	30.5	438	0	22	35	25	45	45	35	220		
S42-HFS-07	S42-B20	6	390		22	35	25	45	40	35	120	50	
S42-HFS-16	S42-PF5	209	680		25	35	20	40		35	480		45
S43	<i>Hafa Adai</i>												
S43-HFS-03	S43-B16	13.3	412	0	22	35	25	45		35	250		
S43-HFS-04	S43-PF1	209.4	627		22	20	35	45	40	35	420		60 spme
S43-HFS-05	S43-P2	219.1	663		23	35	25	45		35	500		
S43-HFS-06	S43-PF3	238.6	535		22	35	25	45	40	35	280		45
S43-HFS-09	S43-LVB	16.3	82		22	10				20	30		
S43-HFS-11	S43-B22	16.7	422		27	35	25	40	40	35	220		
S44	<i>Hafa Adai</i>												
S44-HFS-02	S44-P2	13	542	0	22	35	30	90		35	280	50	
S44-HFS-03	S44-P1	331.8	395		30	35	15			35	225		45
S44-HFS-04	S44-P3	340	635	103	20	35	20	45		35	425		45
S44-HFS-05	S44-P4	340	497	240	22	35	20	45	30	35	255		45
S44-HFS-10	S44-P6	32.5	65							35	30		
S44-HFS-11	S44-BF19	30	480	0	22	35	25	45	45	35	225		
S44-HFS-14	S44-B16	37.7	400	0	25	35	30	45	40	35	190		
S44-HFS-17	S44-P8	91.7	675	0	25	35	25	45	210	35	250	50	
S44-HFS-18	S44-P7	107	682	0	22	35	25	45		35	520		
S44-HFS-19	S44-B17	95	436	0	22	35	30	45		35	230		
S44-HFS-20	S44-B18	2	450		32	35	35	90	40	35	120		
S47	<i>Perseverance</i>												
S47-HFS01	S47-B16	43.2	466	4	22	35	25	45		35	230		

SuBastian Sample#	lab sample#	Tmax °C	Sample volume mL	gas head mL	gas-H2O mL	pH/Alk mL	H2S/Si mL	Nutrients	DOC mL	Majors mL	TM mL	Microbio	S isotope
S47-HFS-04	S47-BF17	26.5	463	0	22	35	35	45	40	35	240		
S47-HFS-10	S47-P8	221.8	737	48	22	35	20	40	40	35	500		45
S47-HFS-15	S47-B18	16.4	305		25	35	25	45		30	95	50	
S47-HFS-16	S47-BF19	73.5	436		22	35	30	45	40	35	215		
<i>S49</i>	<i>Perseverance</i>												
S49-HFS-03	S49-BF17	1.4	392		32	35	45	45		35	200		
S49-HFS-08	S49-BF19	21	417		22	35	25	45	40	30	220		
S49-HFS-11	S49-B20	19.3	360		0	35	45	45		35	130	50	20 SPME

4.2.2 Gas Chemistry

Tamara Baumberger, NRC post-doc

In total, 10 pre-evacuated gas-tight bottle samplers (GTB; sampler volumes between about 150 and 165 ml) were sent to the Mariana back-arc for the *R/V Falkor* expedition in Nov/Dec 2016. Seven of these were used at sea to collect high-temperature vent fluid samples at 3 different vent fields, namely Alice Springs (1), Hafa Adai (4) and Perseverance (2). There was no extraction line at sea. Subsampling of the GTBs was done in the NOAA/PMEL Helium isotope laboratory in Newport, OR between Feb 27th and March 2nd 2017. Six of the 7 GTB samples can be expected to yield useable data, one GTB from the field, Hafa Adai, was empty (S42-GTB-21). Total gas concentrations were between 17 and 80 mmol/kg with fluid amounts between 130 and 165 g. Subsampling was conducted into splits of 3 cc aluminosilicate ampules for later helium and neon isotope analysis and in 35 cc Pyrex ampules for later total gas concentration and carbon/hydrogen isotope analysis. Two of the non-triggered GTBs (GTB 10 and GTB 5) were used for the determination of the procedure blank and thus subsampled as well (contained zero to near zero gas).

Gas-tight samples FK161129

Sample #	GTB #	Dive Location	Observation	Latitude	Longitude	Depth (m)	Temp degC	Gas (mmol/kg)	Fluid (g)	#splits 3cc/35cc
S39-GTB-06	GT 6	Alice Springs	S39-GTB-06 Fired. Yellow #9 GTB. In the hole with good verification of the wand tip in the pilot camera. Sample looked really good.	18.21041	144.70728	3611.08	161	17.1	165.77	3/3
S41-GTB-02	GT 7	Hafa Adai: Sequoia	S41-GTB-02 Red-green taken from the same orifice the 302deg fluid was measured with the ROV wand. From the west side of the chimney near the base but where the active venting began.	16.96108	144.8669	3274.25	302	23.4	160.67	3/3
S42-GTB-21 (failed)	GT 12	Hafa Adai: Sequoia	S42-GTB-21 Fired when saw deflection in the black smoke. Tip moved when the ram was fired (moved away from orifice when it was fired). Same orifice as sampled with HFS.	16.96116	144.86696	3261.07	345	Empty	Empty	

Gas-tight samples FK161129

Sample #	GTB #	Dive Location	Observation	Latitude	Longitude	Depth (m)	Temp degC	Gas (mmol/kg)	Fluid (g)	#splits 3cc/35cc
S43-GTB-07	GT 17	Hafa Adai: Alba	S43-GTB-07 Fired. In the black smoke in the smoker in the back of the small chimney in front. When fired saw the wand go further in the orifice. Same hole as the HFS samples here but at a slightly different angle.	16.96124	144.86785	3277.79	239	21.6	153.03	3/3
S44-GTB-06	GT 11	Hafa Adai: Two Towers	S44-GTB-06 Fired and saw it suck up in perfect position. In the same chimlet as the HFS samples. Good deflection of the flow.	16.96132	144.86659	3268.79	340	62.6	130.7	4/4
S47-GTB-09	GT 9	Perseverance: Stump of Mystery	S47-GTB-09 Fired. Probe was down the hole at Stump of Mystery. Red Gastight #9. Taken from the top of the chimney in a hole that was excavated.	15.48012	144.50764	3906.54	264	80.3	149.4	4/4
S49-GTB-04	GT 2	Perseverance: Stump of Mystery	S49-GTB-04 Fired. This was fired before the view of the bent ram. Saw the tip go into the chimney (not further into the hold) when fired. Questions raised if it actually fired so not logged at the time as a sample.	15.4801	144.50776	3906.67	250	35.6	157.11	4/4

Bottles not triggered:

not used	GT 16		Loose hydraulic trigger? Needs fix?					Empty - not sampled	Empty - not sampled	
not used	GT 10		To seafloor and back, not used					0	0	1/1
not used	GT 5		Used for fit testing on ROV, not triggered, did not go to the seafloor					0	0	1/1

4.3 Microbiology

Hydrothermal Vent Microbial Ecology

Julie Huber

The main objectives on this cruise were to (1) quantify microbial biomass in venting fluids; (2) preserve venting fluids for single cell genomic analyses; (3) collect diffuse fluids that were *in situ* filtered and preserved (with RNALater) to determine and quantify functional repertoire of total active microbial communities in venting fluids; (4) conduct shipboard and seafloor stable isotope probing experiments with diffuse vent fluids enriched with labeled DIC under thermophilic and hyperthermophilic conditions to determine which microbes are actively fixing carbon; (5) estimate potential activity and carbon uptake rates by both autotrophs and heterotrophs in venting fluids at 80 °C; and (6) enrich for a variety of mesophilic, thermophilic, and hyperthermophilic microbes from venting fluids. We sampled fluids with the HFPS, as well as CTD. A number of biological and animal samples were also collected for symbiont analyses. A complete sample table is shown in Table 4.3-1.

I. Vent Fluid Counts: To quantify microbial biomass using epifluorescent microscopy, vent fluid was collected and preserved in labeled scintillation vials, 2 x 18 mL, with 1.8 mL 37% formaldehyde. Vials were mixed via shaking after adding fixative, sealed with electrical tape, and stored at 4 °C. On land, cells were quantified using DAPI. Results are shown in Table 4.3-2.

II. Vent Fluid Single Cell Genomics: Vent fluid was collected on each dive for single cell genomics. For preservation, 1 mL of fluid was added to a sterile cryovial with 100 µL of filter-sterilized GlyTE buffer. Vials were then inverted for mixing and incubated at room temperature for 5 minutes before being frozen at -80°C. Triplicate samples were taken for each sample.

III: Metagenomics and metatranscriptomics from vents, background, plume: To better understand the metabolic potential and gene expression patterns of subseafloor communities, we collected samples for 'omics analyses from multiple vents. For each dive, two filter holders containing a 0.2 µm, 47 mm flat filter with ~20 mL RNALater were loaded onto the HFPS. At each diffuse vent, ~3 L of fluid was pumped through each filter and then the filter was preserved *in situ* with RNALater. Once on deck, filters were removed from their holders, folded into quarters and placed into sterile 50 mL Falcon tubes with ~10 mL of fresh RNALater. Tubes were kept at 4 °C for 24 hours and then moved to -80 °C for the remainder of the cruise. DNA extraction was carried out on land using standard Huber lab chloroform-phenol extraction methods, with results of DNA extraction shown in Table 4.3-2.

For background and plume: An 'omics sample from background seawater and the plume near the soon-to-be confirmed Perseverance site was also collected in a cubitainer from a Niskin. ~15 liters of water was filtered through a 0.2 µm Sterivex filter, preserved in RNALater, placed at 4°C for 24 hours, then stored at -80°C.



Figure 4.3-7 HFS sampling at Mkr-138, Illium area.

Table 4.3-1. Summary of Samples Collected for Microbial Analysis

Huber #	Sample #	Counts	SCG	Omics	SIP	Cult	Rates	Chem	Site	Vent
FS919	S34-HFS-06			x					Daikoku	10m eas of Okeanos Fish Spa
S34-GEO-08	S34-GEO-08			x					Daikoku	10m east of Okeanos Fish Spa; Yellow/black globules of sulfur
S34-GEO-10	S34-GEO-10			x					Daikoku	Mkr 132 FK-2016 Fish Spa; Whitish sulfur crust
S34-BIO-03	S34-BIO-03			x					Daikoku	10m east of Okeanos Fish Spa; Sulfur sediment around fish
S35-Bio-10	S35-Bio-10								Daikoku	20m E/5m N WP2 crater rim; Inside wall of big crater near rim
FS921	S35-HFS-16			x					Daikoku	Okeanos Fish Spa
FS922	S37-HFS-06	x	x	x	x	x		x	Ilium	Snail Pile Mkr 138
S39-HFS-01	S39-HFS-01	x							Alice Springs	Diffuse site 22m NE of old Alice Springs
FS923	S39-HFS-07	x	x		x				Alice Springs	Mkr-131 Snail-001 Site
S39-HFS-08	S39-HFS-08	x	x			x			Alice Springs	Mkr-131 Snail-001 Site
FS923	S39-HFS-10				x				Alice Springs	Mkr-131 Snail-001 Site
S40-HFS-07	S40-HFS-07	x	x			x			Burke	Snail Pit Mkr-234
FS924	S40-HFS-09	x	x			x	x	x	Burke	Snail Pit Mkr-234
FS924	S40-HFS-10			x					Burke	Snail Pit Mkr-234
S40-HFS-11	S40-HFS-11	x							Burke	Snail Pit Mkr-234
S40-HFS-14	S40-HFS-14	x							Burke	Milky Flow
FS925	S42-HFS-01	x	x		x				Hafa Adai	Hula Array
FS925	S42-HFS-05				x				Hafa Adai	Hula Array
FS925	S42-HFS-06			x					Hafa Adai	Hula Array
S42-HFS-07	S42-HFS-07	x	x						Hafa Adai	Hula Array
FS926	S43-HFS-09	x	x		x	x	x	x	Hafa Adai	Alba Vent
FS926	S43-HFS-10			x					Hafa Adai	Alba Vent
FS927	S44-HFS-02	x							Hafa Adai	Mami Wati
FS927	S44-HFS-12	x	x		x	x	x		Hafa Adai	Hula array
FS927	S44-HFS-13			x					Hafa Adai	Hula array
FS927	S44-HFS-17	x	x			x			Hafa Adai	Hula array
V16A-01-Btd17	V16A-01-Btd17	x		x					15.5 N	over yet to be explored vent field (Perseverance), in plume
V16A-01-Btd23	V16A-01-Btd23	x		x					15.5 N	over yet to be explored vent field (Perseverance), background
S47-HFS-01	S47-HFS-01	x	x						Perseverance	Leaning Tower
FS928	S47-HFS-05	x	x		x	x	x	x	Perseverance	Leaning Tower
FS928	S47-HFS-06			x					Perseverance	Leaning Tower
S47-HFS-15	S47-HFS-15	x	x						Perseverance	Stump of Mystery
S49-HFS-01	S49-HFS-01			x					Perseverance	Background Seawater 3663 to 2640 m
FS929	S49-HFS-10			x					Perseverance	Limpet Canyon
FS929	S49-HFS-11	x	x						Perseverance	Limpet Canyon

Table 4.3-2. Results of DNA and microbial biomass quantification

Sample	DNA (ng/ul)	Counts (cells/ml)	Site	Vent
S34-HFS-06	0.09		Daikoku	10m eas of Okeanos Fish Spa
S34-GEO-08	x		Daikoku	10m east of Okeanos Fish Spa; Yellow/black globules of sulfur
S34-GEO-10	x		Daikoku	Mkr 132 FK-2016 Fish Spa; Whitish sulfur crust
S34-BIO-03	x		Daikoku	10m east of Okeanos Fish Spa; Sulfur sediment around fish
S35-Bio-10			Daikoku	20m E/5m N WP2 crater rim; Inside wall of big crater near rim
S35-HFS-16	0.66		Daikoku	Okeanos Fish Spa
S37-HFS-06	0.14	2.20E+05	Ilium	Snail Pile Mkr 138
S37-HFS-08	0.42		Ilium	Snail Pile Mkr 138
S39-HFS-01		3.30E+05	Alice Springs	Diffuse site 22m NE of old Alice Springs
S39-HFS-07		1.80E+05	Alice Springs	Mkr-131 Snail-001 Site
S39-HFS-08		2.10E+05	Alice Springs	Mkr-131 Snail-001 Site
S39-HFS-10	0.12		Alice Springs	Mkr-131 Snail-001 Site
S40-HFS-07		3.30E+05	Burke	Snail Pit Mkr-234
S40-HFS-09		1.80E+05	Burke	Snail Pit Mkr-234
S40-HFS-10	14.93		Burke	Snail Pit Mkr-234
S40-HFS-11		6.60E+04	Burke	Snail Pit Mkr-234
S40-HFS-14		3.50E+05	Burke	Milky Flow
S42-HFS-01		3.20E+05	Hafa Adai	Hula Array
S42-HFS-05			Hafa Adai	Hula Array
S42-HFS-06	1.23		Hafa Adai	Hula Array
S42-HFS-07		2.40E+05	Hafa Adai	Hula Array
S43-HFS-09		2.40E+05	Hafa Adai	Alba Vent
S43-HFS-10	7.18		Hafa Adai	Alba Vent
S44-HFS-02		2.30E+05	Hafa Adai	Mami Wati
S44-HFS-12		4.80E+05	Hafa Adai	Hula array
S44-HFS-13	44.94		Hafa Adai	Hula array
S44-HFS-17		4.80E+05	Hafa Adai	Hula array
V16A-01-Btl17	0.42	1.80E+05	15.5 N	over yet to be explored vent field (Perseverance), in plume
V16A-01-Btl23	0.36	1.50E+05	15.5 N	over yet to be explored vent field (Perseverance), background
S47-HFS-01		3.40E+05	Perseverance	Leaning Tower
S47-HFS-05		1.10E+05	Perseverance	Leaning Tower
S47-HFS-06	0.08		Perseverance	Leaning Tower
S47-HFS-15		4.40E+05	Perseverance	Stump of Mystery
S49-HFS-01	0.07		Perseverance	Background Seawater 3663 to 2640 m
S49-HFS-10			Perseverance	Limpet Canyon
S49-HFS-11	16.9	1.00E+06	Perseverance	Limpet Canyon

IV. RNA-Stable Isotope Probing (RNA-SIP) experiments: Fluid was collected from the HFPS Large Volume Bag (LVB) sampler for determining who the active autotrophs at each site were using RNA Stable Isotope Probing. The LVB was filled with ~4 liters of fluid and used to fill evacuated 500 mL bottles to a volume of 530 mL. To each bottle we added 8.83 mL of either ¹²C or ¹³C sodium bicarbonate for a final concentration of 10 mM. After filling, 1-2 mL of 10% HCl was added until the fluid had a pH < 6.5 to ensure the SIP incubation was similar to vent conditions. We then added 20 mL (~900 μmoles) of 99.99% H₂ gas to each bottle for a concentration of ~20 μM H₂ in solution. Our previous work has shown that the addition of hydrogen is necessary for label uptake in our SIP experiments. Bottles were then incubated lying on their sides at either 55 °C or 80 °C. It was important to incubate bottles on their sides to keep the hydrogen from escaping through the stopper. The chart below shows the setup and incubation times for all shipboard SIP experiments.

Table 4.3-3. Details of RNA-SIP experiments carried out shipboard

Huber #	Label	Dive	Sample #	Vent	Incubation time
FS922	FS922-80-12DIC-18h	S37	S37-HFS-06	Illium, Snail Pile Mkr 138	18
FS922	FS922-80-13DIC-18h	S37	S37-HFS-06	Illium, Snail Pile Mkr 138	18
FS922	FS922-55-12DIC-18h	S37	S37-HFS-06	Illium, Snail Pile Mkr 138	18
FS922	FS922-55-13DIC-18h	S37	S37-HFS-06	Illium, Snail Pile Mkr 138	18
FS923	FS923-80-12DIC-18h	S39	S39-HFS-7	Alice Springs, Mkr 131 Snail-001 Site	18
FS923	FS923-80-13DIC-18h	S39	S39-HFS-7	Alice Springs, Mkr 131 Snail-001 Site	18
FS924	FS924-80-12DIC-18h	S40	S40-HFS-10	Burke, Snail Pit Mkr 234	18
FS924	FS924-80-13DIC-9h	S40	S40-HFS-10	Burke, Snail Pit Mkr 234	9
FS924	FS924-80-13DIC-18h	S40	S40-HFS-10	Burke, Snail Pit Mkr 234	18
FS924	FS924-55-12DIC-18h	S40	S40-HFS-10	Burke, Snail Pit Mkr 234	18
FS924	FS924-55-13DIC-18h	S40	S40-HFS-10	Burke, Snail Pit Mkr 234	18
FS925	FS925-80-12DIC-18h	S42	S39-HFS-9	Hafa Adei, Hula Array	18
FS925	FS925-80-13DIC-18h	S42	S39-HFS-9	Hafa Adei, Hula Array	18
FS926	FS926-80-12DIC-18h	S43	S43-HFS-09	Hafa Adei, Alba Vent	18
FS926	FS926-80-13DIC-9h	S43	S40-HFS-09	Hafa Adei, Alba Vent	9
FS926	FS926-80-13DIC-18h	S43	S40-HFS-09	Hafa Adei, Alba Vent	18
FS926	FS926-55-12DIC-18h	S43	S40-HFS-09	Hafa Adei, Alba Vent	18
FS926	FS926-55-13DIC-18h	S43	S40-HFS-09	Hafa Adei, Alba Vent	18
FS927	FS927-80-12DIC-18h	S44	S44-HFS-12	Hafa Adei, Hula Array	18
FS927	FS927-80-13DIC-9h	S44	S44-HFS-12	Hafa Adei, Hula Array	9
FS927	FS927-80-13DIC-18h	S44	S44-HFS-12	Hafa Adei, Hula Array	18
FS927	FS927-55-12DIC-18h	S44	S44-HFS-12	Hafa Adei, Hula Array	18
FS927	FS927-55-12DIC-9h	S44	S44-HFS-12	Hafa Adei, Hula Array	9
FS927	FS927-55-13DIC-18h	S44	S44-HFS-12	Hafa Adei, Hula Array	18
FS928	FS928-80-12DIC-18h	S47	S47-HFS-05	Perseverance, Leaning Towers	18
FS928	FS928-80-13DIC-18h	S47	S47-HFS-05	Perseverance, Leaning Towers	18
FS928	FS928-55-12DIC-18h	S47	S47-HFS-05	Perseverance, Leaning Towers	18
FS928	FS928-55-13DIC-18h	S47	S47-HFS-05	Perseverance, Leaning Towers	18

V. NanoSIMS Rate Experiments: The goal of these experiments was to estimate carbon uptake rates by both autotrophs (DIC uptake) and heterotrophs (acetate uptake), as well as general microbial activity. This was done by adding ^{13}C labeled bicarbonate or ^{13}C labeled acetate to vent fluid, together with D_2O . Balch tubes were prepared on land in the anaerobic chamber with 10% labeled substrates. 175 μl of a 600 mM stock solution of HCO_3^- with a $^{12}\text{C}:$ ^{13}C ratio of 10 to 1, while for the Acetate incubations it was 63 μL of a 10 mM stock solution of acetate with a $^{12}\text{C}:$ ^{13}C ratio of 10 to 1. With ~20 mL of vent fluid added to each tube, this resulted in a final concentration of approximately 5 mM DIC and 30 μM acetate. 2 mL of 99.99% D_2O was also added to each tube for a final concentration of 10%. Each Balch tube was gassed with N_2 before shipment. After vent fluid was added to each tube, 2 bars of hydrogen was added, giving an overlying atmosphere of 50% N_2 /50% H_2 . Tubes were incubated at 80 °C for 9 and 18 hours. To end the experiment, head space was released and 1 mL of 40% paraformaldehyde was added to each tube for a final concentration of 2%. Each tube was shaken gently and stored at 4 °C.

Rate experiments were performed at sites to correspond to the locations and temperatures of the SIP experiments and the fluid sample came from the same bag as that used for the SIP experiment. For each temperature and site, four separate incubations were performed, as shown in the table below. All tubes were returned to the laboratory and will be analyzed using nanoscale secondary ion mass spectrometry (Nano-SIMS) and microscopy.

Table 4.3-4. Example set up of Nano-SIMS rate experiment.

Tube #	Sample	Temp	Hrs	Label 1	Label 2
MBA1		80	9	none	none
MBA2		80	9	none	none
MBA3		80	9	none	none
MBA4		80	18	none	none
MBA5		80	18	none	none
MBA6		80	18	none	none
MBA7		80	9	D_2O	none
MBA8		80	9	D_2O	none
MBA9		80	9	D_2O	none
MBA10		80	18	D_2O	none
MBA11		80	18	D_2O	none
MBA12		80	18	D_2O	none
MBA13		80	9	D_2O	Acetate
MBA14		80	9	D_2O	Acetate
MBA15		80	9	D_2O	Acetate
MBA16		80	18	D_2O	Acetate
MBA17		80	18	D_2O	Acetate
MBA18		80	18	D_2O	Acetate
MBA19		80	9	D_2O	Bicarbonate
MBA20		80	9	D_2O	Bicarbonate
MBA21		80	9	D_2O	Bicarbonate
MBA22		80	18	D_2O	Bicarbonate
MBA23		80	18	D_2O	Bicarbonate
MBA24		80	18	D_2O	Bicarbonate

Table 4.3-5. Nano-SIMS rate experiments carried out shipboard

Huber #	Sample #	Rates	Site	Vent
FS924	S40-HFS-09	x	Burke	Snail Pit Mkr-234
FS926	S43-HFS-09	x	Hafa Adai	Alba Vent
FS927	S44-HFS-12	x	Hafa Adai	Hula array
FS928	S47-HFS-05	x	Perseverance	Leaning Tower

VI. Enrichment Culturing: ~1 mL of vent fluid sample was added to each tube, along with headspace as necessary. Tubes were incubated in ovens shipboard monitored for turbidity. Media used are shown below.

Table 4.3-6. Media used during the cruise

Target Organism	DSMZ	Label	Notes	Before Inoculating	HS	Temp
<i>Nautilia profundicola</i>	18972	Nau+NO3	In balch tubes	reduce with 0.15ml 2.5% Na2S	H2/CO2	55 and 80
<i>Caminibacter profundus</i>	15016	Cami+NO3	In balch tubes	none	H2/CO2	55 and 80
<i>Thermococcus</i>		CamiOrg	In balch tubes	reduce with 0.15ml 2.5% Na2S	none	55 and 80
<i>Sulfurimonas paralvinella</i>	1251	Sulf+O2	In balch tubes	add up to 10% O2 to headspace	H2/CO2	30 and 55
<i>Sulfurimonas paralvinella</i>	1251	Sulf	In balch tubes	none	H2/CO2	30 and 55

Tubes were analyzed via microscopy on land and cultivars are currently being worked with in the Huber lab. Post-cruise results are shown below.

Table 4.3-7. Microscopic counts of enrichment culturing at sea

Media	Temp	Headspace	Red Agent	# of Positives
Nau+NO3	55	H2/CO2	Na2S	3
CamiOrg	55	none	Na2S	4
CamiOrg	80	none	Na2S	6
Cami+NO3	55	H2/CO2	none	2
Cami+NO3	80	H2/CO2	none	3
Sulf	30	H2/CO2	none	6
Sulf	55	H2/CO2	none	4
Sulf+O2	30	H2/CO2	none	8
Sulf+O2	55	H2/CO2	none	3

4.4 Biology

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Our hydrothermal ‘hunting’ was quite successful biologically because of the opportunity to examine a very important biogeographic region and to sample in detail. Samples from the dives (see list) will be processed primarily to document species distributions. Our primary objective is to map the diversity and species distributions to compare with the southern backarc, the volcanic arc and with the northwestern Pacific biogeographic region. In addition, we plan detailed work on the biology of the hairy snails (*Alviniconcha*) that we endeavoured to collect at each back-arc site. Additional work will include genetic connectivity along the back arc among populations of this snail and or the shrimp *Chorocaris vandoveri*. To advance population level traits, we also sampled *Alviniconcha* for gill and gonad tissues at multiple sites. These samples will comprise a basis for describing the reproductive biology of *Alviniconcha*, as well as to quantify the morphological responses of the gill and bacteriocytes across vents with different fluid chemistry.



Figure 4.4-1 Sample of chimney with snails at Chamorro.

Volcanic Arc Sites – Our dives on Daikoku confirmed the very high abundances of the tonguefish *Symphurus thermophilus*. Repeated sampling of the sediments they inhabit revealed no potential food source for the dense population. Unfortunately, we were unable to collect extensive samples to resolve nutrition sources. The very short dive on Chamorro confirmed that vents were colonized and we did collect a few specimens of a large hairy snail that is probably a species known only from Diamante Seamount.

Alice Springs – The surprise here was i) how small the sites were and ii) how unchanged they appear to be from the sparse description available from 1987 discovery and 1992 visit.

It is unlikely that we collected any more species than those originally recorded. This



Figure 4.4-2 Diffuse venting site at Alice Springs.



Figure 4.4-3 Sulfides at the Leaning Tower site at Perseverance.

site may be a testament to long-term stability in venting.

Hafa Adai – This new site offered much greater habitat variability, including the large chimneys. Biomass, however, was relatively low as fluid flux appeared constrained by the non-porous sulphide matrix. We did find mussels but no extensive mussel beds, nor were any tubeworms evident (here or any back-arc field). Shrimp, limpet, hairy snails and crabs were the main components of the biomass and meiofauna was remarkably sparse.

Perseverance – This field appeared to be in decline. The many dead chimneys suggest that venting may have supported a wider array of communities than we encountered. The species collected were those seen further north, and known from sites in the southern back-arc.

In summary, we have confirmed our hypothesis that vent species distributions along the Mariana back-arc, from Snail to Alice Springs span the entire range and that habitat types appear very similar. These large ranges stand in notable contrast to species on the volcanic arc.

Small-scale temperature and fluid chemistry –

In addition to regional biodiversity and species biology comparisons, we advanced our understanding of centimeter-scale processes and patterns. We measured the temperature of hydrothermal vents fluids at scales using a grid of 45 temperature loggers deployed over gradient of 100 to 5 ° C covering an area of ~ 0.5 m². Within this grid we measured dissolved oxygen concentration and pH using the sensors on HFPS, and deployed “robocritters”. Robocritters are

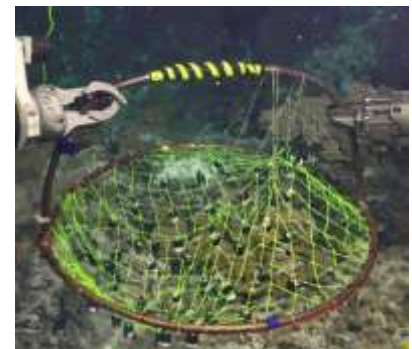


Figure 4.4-4 Temperature grid ("hula-hoop") deployed at Voodoo crater in Hafa Adai.

designed to mimic body temperature and are comprised of a temperature logger, embedded in epoxy, and set within a snail or mussel shell. We deployed our temperature grid and robocritters over a 2.5 day observation window with readings at 5 minute intervals. We will (1) compare the temperature of the fluids interpolated from the temperature grid measurements to the temperatures experienced by our robocritters and (2) estimate temporal patterns in dissolved oxygen concentration and pH based on our spatial point measurements.

Table 4.4-1 Biological Samples Recovered

DiveSite	Dive	Date	Sample	On Deck	Latitude	Longitude	Depth	Location
Daikoku	34	12/1/2016	S34-02,-03	Sieved sediments – nearly nothing	21.32509	144.19171	410	10m East of OE Fish Spa
Daikoku	34	12/2/2016	S34-Bio-09	Sediments one polychaete, fish lost	21.32493	144.19165	403	Mkr-132 FK-2016 Fish Spa
Daikoku	34	12/2/2016	S34-11C	9 fish dissected; nothing in sediment	21.32488	144.19175	398	25m E of waypoint 2 (Sulfur pond)
Daikoku	35	2016-12-03	S35-Bio-10	<i>Lamellibrachia satsumi</i> tubeworms	21.32378	144.19229	355	20m E/5mN WP2 crater rim
Daikoku	35	2016-12-03	S35-Bio-12	Nothing in sediment	21.32421	144.19205	371	Mkr-137
Daikoku	35	2016-12-03	S35-17 +18	Two crabs	21.32502	144.19165	407	10m SE OE Fish Spa
Chamorro	36	2016-12-04	S36-Geo-01	<i>Alviniconcha cf adamantis</i> (5)	20.82146	144.70705	919.73	Waypoint 1
Illum	37	2016-12-05	S37-Bio-10	27 snails (<i>Alvini-concha hessleri</i>)	18.21359	144.70748	3582	Snail Pile Mkr-138
Illum	37	2016-12-05	S37-Bio-13	Crab, shrimp and debris	18.21359	144.70748	3582	Snail Pile Mkr-138
Illum	37	2016-12-05	S37-Bio-14	~30 shrimp plus debris	18.21359	144.70748	3582	Snail Pile Mkr-138
Alice Springs	39	2016-12-06	S39-Geo-11	~100 barnacle; mussel; gastropods	18.21033	144.70731	3611	Mkr-131 Snail-001 Site
Alice Springs	39	2016-12-06	S39-12 - 14	3 crabs; 5 hairy snails	18.21033	144.70731	3611	Mkr-131 Snail-001 Site
Alice Springs	39	2016-12-06	S39-Bio-15	2 large anemones; ~20 zoanthids	18.21054	144.70745	3598	Little Anemones
Burke	40	2016-12-07	S40-Bio-01	85 shrimp; one mussel	18.18257	144.71989	3630	Snail Pit Mkr-234
Burke	40	2016-12-07	S40-02, -03	Meiofauna; gastropods, crab	18.18257	144.71989	3630	Snail Pit Mkr-234
Burke	40	2016-12-07	S40-Geo-04	limpets	18.18257	144.71989	3630	Snail Pit Mkr-234
Burke	40	2016-12-07	S40-12, -13	Hairy snails ; Robosnail site	18.18257	144.71989	3631	Snail Pit Mkr-234

DiveSite	Dive	Date	Sample	On Deck	Latitude	Longitude	Depth	Location
Hafa Adai	41	2016-12-08	S41-03, -04	58 hairy snails; shrimp	16.96115	144.86696	3274	Sequoia
Hafa Adai	41	2016-12-08	S41-Bio-05	Crabs; meiofauna	16.96115	144.86696	3274	Sequoia
Hafa Adai	41	2016-12-08	S41-Bio-10	White snail	16.96079	144.87041	3280	Waypoint 7
Hafa Adai	42	2016-12-09	S42-09, -10, -11	Snail shells; 2 white phymorhychids	16.96174	144.86911	3284	Snail Graveyard
Hafa Adai	42	2016-12-09	S42-Geo-12	Barnacles; debris	16.96168	144.86920	3278	Rim above graveyard
Hafa Adai	43	2016-12-10	S43-Bio-14	Solid Phase Micro-extraction puck #4	16.96126	144.86787	3277	Alba Vent
Hafa Adai	44	2016-12-11	S44-Bio-15	Hairy snails; cold part of Hula	16.96175	144.86919	3278	Hula array
Hafa Adai	44	2016-12-11	S44-Bio-16	Hairy snails; hot part of Hula	16.96174	144.86921	3278	Hula array
Perseverance	47	2016-12-16	S47-Bio-07	Hairy snails; shrimp Alvinellid worms	15.4799	144.50763	3913	Leaning Tower
Perseverance	47	2016-12-16	S47-Geo-08	limpet	15.4799	144.50763	3913	Leaning Tower
Perseverance	47	2016-12-16	S47-Bio-14	Alvinellid worms	15.48018	144.50772	3906	Stump of Mystery
Perseverance	47	2016-12-16	S47-Bio-17	Hairy snails; shrimp	15.48018	144.50772	3909	Stump of Mystery
Perseverance	47	2016-12-16	S47-Bio-18	Alvinellid worms; shrimp	15.48018	144.50772	3909	Stump of Mystery
Perseverance	49	2016-12-18	S49-05, 06	Detritus	15.47989	144.50754	3914	Limpet Canyon

4.5 Water Column Studies

Dave Butterfield and Sharon Walker

4.5.1. CTD Operations

CTD operations were not a major part of our planned work. We conducted CTD ops when it was not possible to do ROV dives and when we were not mapping. The two Marine Techs were extremely busy with ROV-related work, and doing CTD ops was not generally possible at night between dives. We managed to complete three successful CTD casts with water sampling (primarily for gas analysis and some microbiological work) during a period of marginal weather and ROV equipment repair. Where indicated with an X, samples were taken for methane and hydrogen analysis by GC on board. We also saved selected samples for nutrient analysis on shore. We took a number of samples near the chlorophyll maximum in the photic zone, to follow up on a curious gas result from 2015, but the results were not conclusive.

To reiterate what we concluded in 2015, the minimal density stratification in water below 3000 meters can lead to large rise heights and more entrainment (so smaller anomalies) than in shallower regions where stratification limits rise height. Background hydrogen concentration for deep water in this region is approximately 1 nmol/liter. Background methane is variable, sometimes less than 1 nM.

The ship's CTD system comprises a Seabird *9plus* CTD, with additional sensors to measure dissolved oxygen concentration, turbidity (two optical backscatter sensors plus one transmissometer), fluorescence, oxidation-reduction potential (ORP), and altitude. The ship's transmissometer and combined fluorometer/optical backscatter sensor are not sensitive enough and/or do not have adequate resolution to define the hydrothermal plumes in this region. Profiles shown here are from the ORP and optical backscatter sensors supplied by the PMEL-EOI group.

Four vertical CTD casts were conducted during cruise FK161129. The second cast (V16A-02) was aborted after reaching a depth of only 895 m due to unreliable optical backscatter data. This sensor exhibited diminished quality data during the preceding cast (V16A-01 over the 15.5°N vent field, named "Perseverance" during this cruise), however, despite significant hysteresis and background drift during that cast, a plume was well defined by increased turbidity ($\Delta NTU_{max} \sim 0.02$) and a corresponding decrease in ORP ($\Delta E = -38$ mv) from about 3400 m to the seafloor (bottom depth ~ 3900 m). Slightly lower methane and hydrogen concentrations were measured in samples from this cast (methane = 4 nM; hydrogen = 1.8 nM) than were measured in 2015 when maximum methane and hydrogen concentrations were 5 nM and 3 nM, respectively. There was a clear vertical structure to the plume over the Perseverance site in 2016 (Fig 4.5-1).

Our target for vertical cast V16A-01 was one of the plume maxima from T15B-06, and was located ~ 200 m north of where we eventually found the seafloor vents. As noted in the cruise summary, we are not certain that we found all of the vents that exist near 15.5, but we are reasonably sure that we determined the extent of the one vent field that we found at 15.480°N. The 2015 tow data suggest there may be another vent source between 15.5 and 15.54N. At present, there is not enough detailed chemistry from the 2015 tow samples to say if the plume near 15.48°N is likely to have a different source from the plume near 15.53°N. Unfortunately, we ran out of time in 2016 before we could do a more complete search of the seafloor with the ROV.

Cast V16A-03 was located over the south end of the 15.4°N new lava flow, near the location of samples and the strongest ORP anomaly seen during the tow over this segment in 2015 (T15B-06). (Fig 4.5-2) Only a very small ORP signal ($\Delta E = -5$ mv) was detected within 100 m of the seafloor during V16A-03. No significant particle anomaly was present. (Fig 4.5-3)

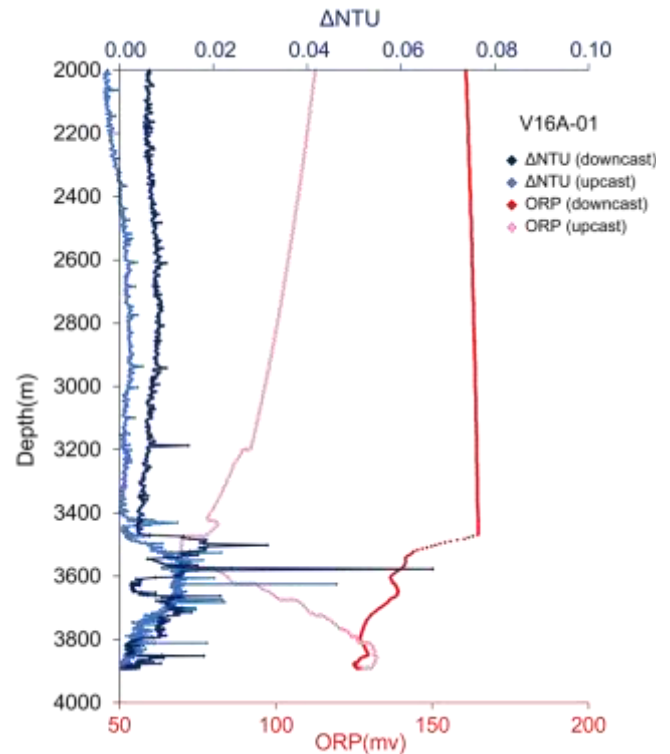


Figure 4.5-1 Turbidity (ΔNTU) and oxidation-reduction potential (ORP) profiles over the 15.5°N "Perseverance" vent field.

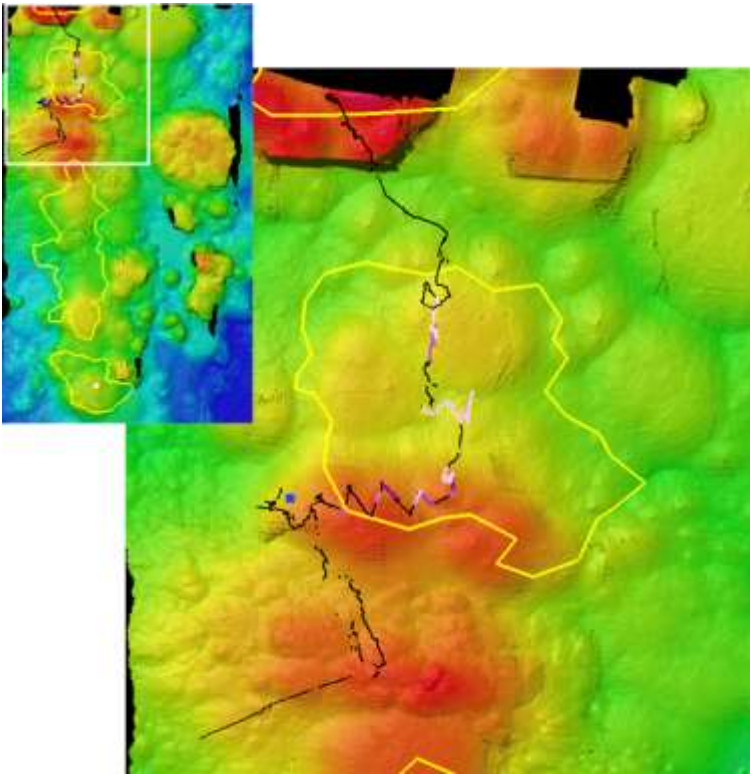


Figure 4.5-2 Location of ORP anomalies (shades of pink, darker colors = larger anomalies) during ROV dive S45 (dive trackline in black) over the new lava flow. Yellow lines outline areas of bathymetry difference > 40 m between 2013 and 2016 multibeam surveys. Inset map is the larger area; white box outlines location of main image. Location of 2015 and 2016 CTD casts are shown by blue and white dots, respectively.

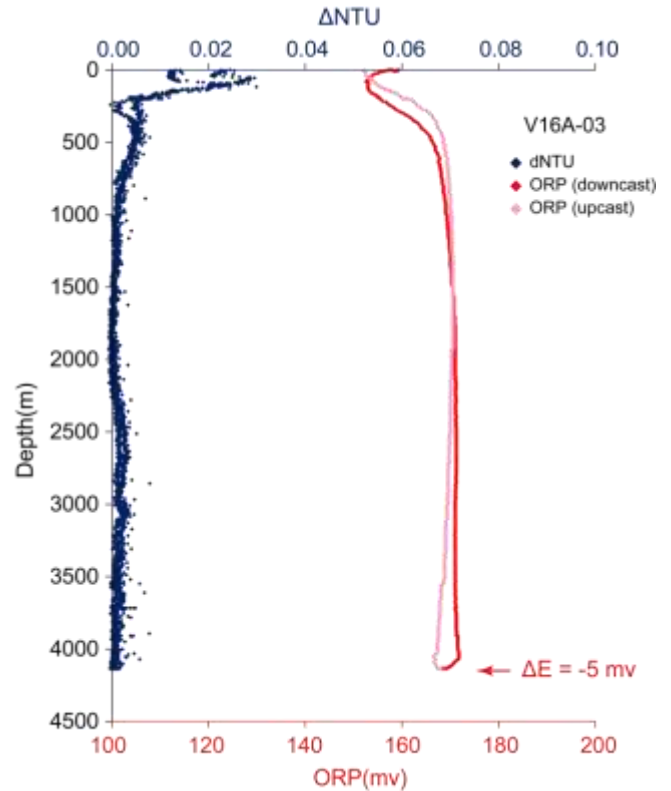


Figure 4.5-3 Turbidity (Δ NTU) and oxidation-reduction potential (ORP) profiles over the 15.4°N lava flow.

The maximum methane concentration was only 3.5 nM in the near-bottom sample (compared to 15 nM in 2015), while the maximum hydrogen concentration (3.0 nM) was measured in the sample ~300 m above the lava flow, and was similar to 2015 values. Note for comparison that the 2015 vertical cast over the new lava flow (V15B-06, 15.424418°N, 144.50295°E) was close to the dive site (S45) this cruise and ~ 2 km north of vertical cast V16A-03. The water column signal over the lava flow is much less pronounced in 2016 than it was in 2015 when the plume was broadly defined by ORP anomalies ($\Delta E \sim -40$ mv) and weak particle anomalies ($dNTU < 0.005$) 200-500 m above the seafloor over the entire length of the new lava flow (T15B-06). However, during dive S45, ORP anomalies in the MAPR data show the new lava is still cooling and discharging detectable reduced chemical species into the overlying ocean.

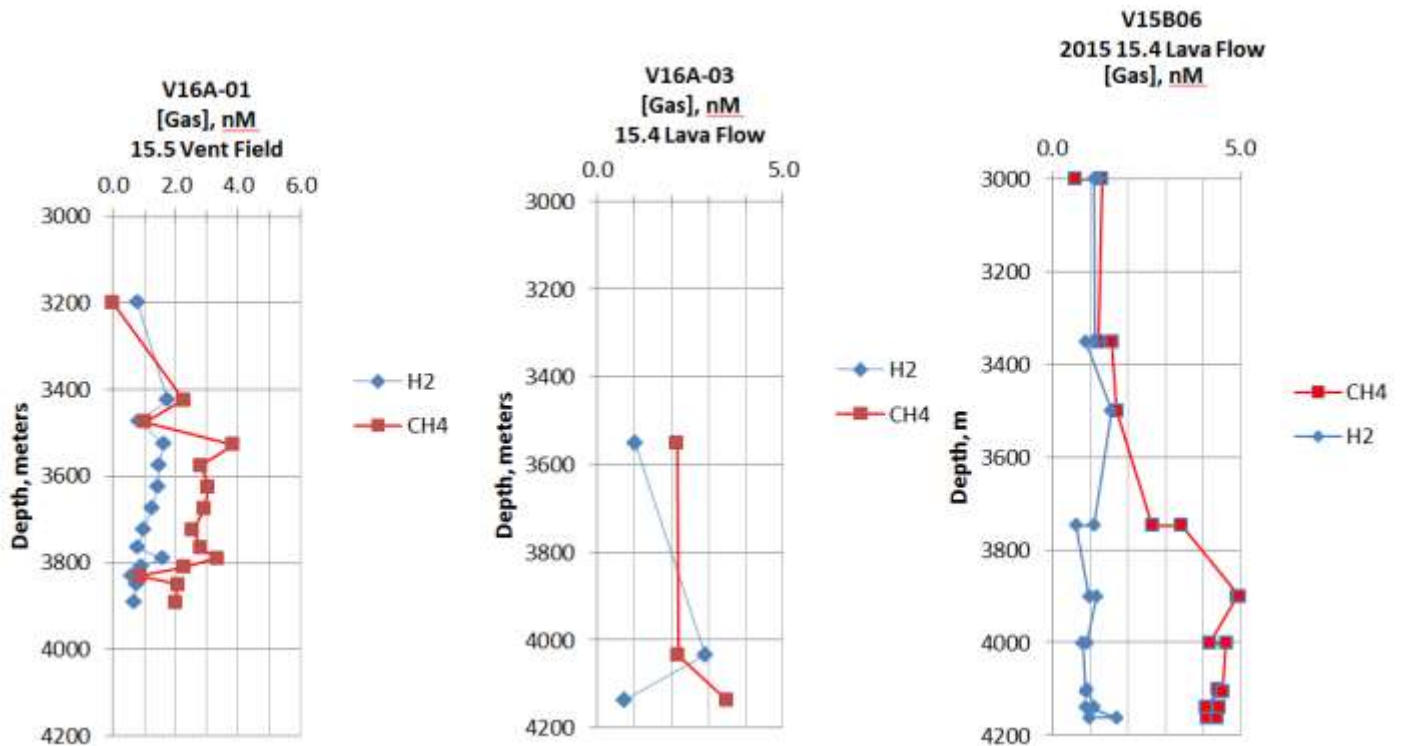


Figure 4.5-4 Vertical cast gas data over the 15.5 Perseverance vent field and the 15.4 lava flow. There is a methane anomaly from near the seafloor to ~3500 m over the vent field in 2016. Over the lava flow, the methane anomaly is much less in 2016 (middle) than it was in 2015 (right).

Cast V16A-04 explored the summit of an off-axis seamount that had never been surveyed before. While there were no definitive signs of hydrothermal activity in this profile, very slight variability in both optical backscatter ($\Delta NTU < 0.003$) and ORP do not completely rule out the presence of very weak diffuse venting here. (Fig 4.5-5)

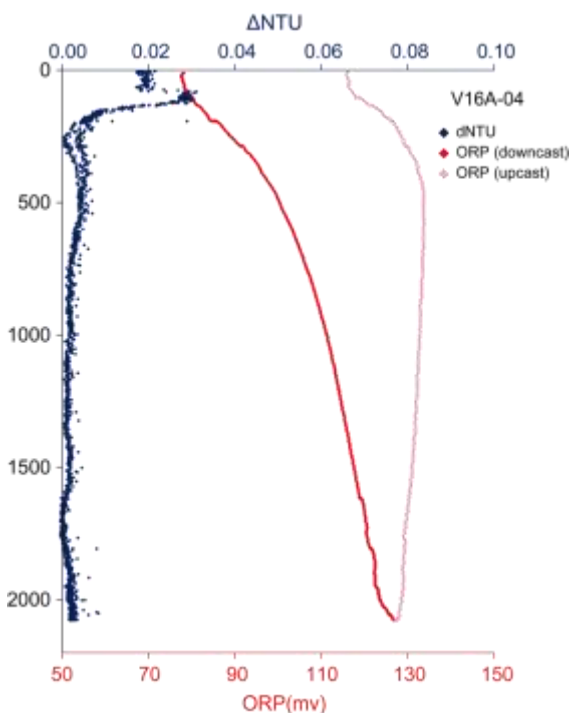


Figure 4.5-5 Turbidity (ΔNTU) and oxidation-reduction potential (ORP) profiles over the summit of the off-axis seamount.

In addition to the CTD casts, a PMEL MAPR (Miniature Autonomous Plume Recorder) attached to ROV *SuBastian* for every dive provided vertical profiles of turbidity, temperature and ORP at each of the back-arc sites. No MAPR data was acquired at the Daikoku dive site (S34 and S35), and only temperature and ORP are available for the dive at the Chamorro site (S36; the optical backscatter sensor was obstructed during this dive due to the way the MAPR was mounted on the ROV). These data provide repeat profiles within a few days and ~400-1000 m radius, and allow an assessment of the variability of the water column plume signals over relatively short temporal and spatial scales, especially at the Perseverance vent field (15.5°N) (Fig 4.5-6), Hafa Adai vent field (17°N)(Fig 4.5-7) and the Alice Springs/Illium/Burke vents (18.2°N) (Fig 4.5-8).

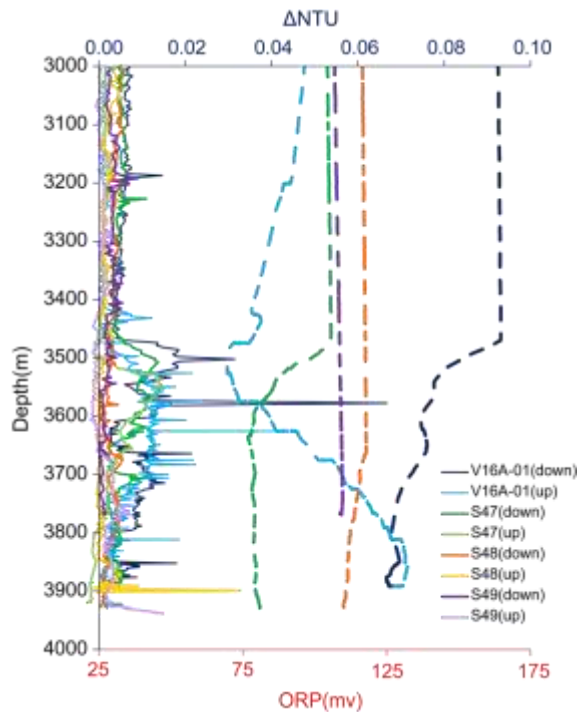


Figure 4.5-6 Variability of Turbidity (solid lines) and oxidation-reduction potential (dashed lines) profiles at the Perseverance (15.5N) vent site over 5.25 days.

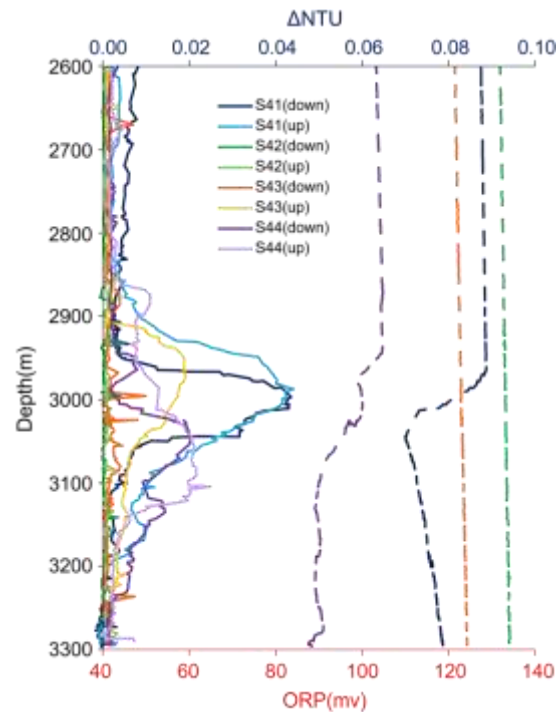


Figure 4.5-7 Variability of Turbidity (solid lines) and oxidation-reduction potential (dashed lines) profiles at the Hafa Adai (17N) vent site over 3.4 days. Dive 41 began just north of the large chimneys on west end of field and ended at vents on east end of field. Dive 42 began mid-field and ended on east side of field. Dive 43 began 1km north of the vent field and ended at the large chimneys. Dive 44 began on east side of field and ended mid-field.

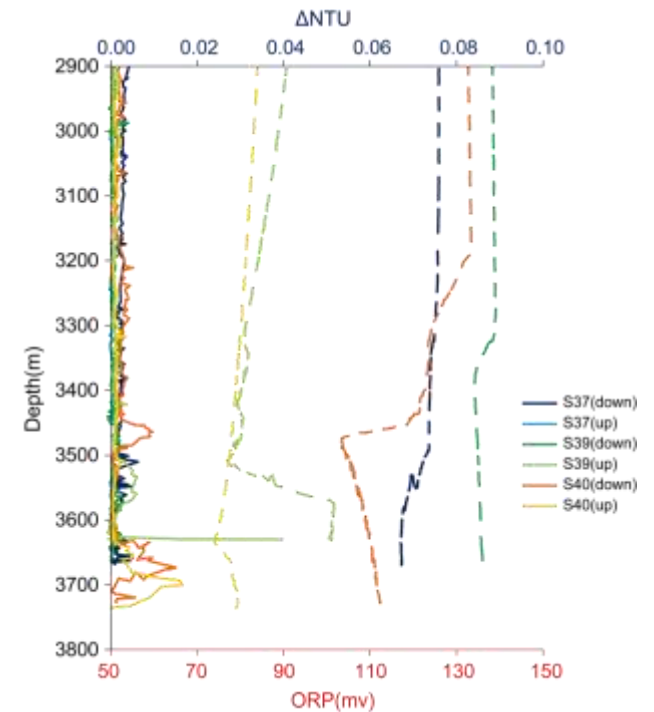


Figure 4.5-8 Variability of Turbidity (solid lines) and oxidation-reduction potential (dashed lines) profiles at Illium (S37), Alice Springs (S39) and Burke (S40) vent sites. Alice Springs and Illium are separated by about 400 m, and these profiles span a time of 1.4 days. The profiles at Burke are separated in time by only the length of the on-bottom time for this dive (~7 hrs), but the distance between the descent and ascent was ~650 m.

Table 4.5-1 CTD Casts

Cast	Location	Latitude	Longitude	Lat-Deg	Lat-Min	Long-Deg	Long-Min
V16A-01	15.5 Vent Field	15.48155	144.50717	15	28.893	144	30.43
V16A-03	Lava Flow	15.40627	144.50628	15	24.376	144	30.377
V16A-04	16.3°N off-axis Seamount	16.31033	144.94817	16	18.62	144	56.89

Table 4.5-2 List of CTD samples.

Cast:		V16A-01	Lat deg	Lat min	Long deg	Long min						
Location:		15.5 Vent Field	15	28.893	144	30.4						
Ros. Pos.	Bottle#	Depth	C	T	LSS V	ORP	Date UTC	Time hhmm UTC	CH4/H2	Nutrients	Micro-bio	Save H2O
1	1	3891	3.1816	1.658	0.2466	120	12-Dec	23:56	x	x		
2	2	3891	3.1816	1.658	0.2466	120	12-Dec	23:56				
3	3	3850	3.1798	1.654	0.246	132	13-Dec	00:09	x	x		
4	4	3850	3.1798	1.654	0.246	132	13-Dec	00:09				
5	5	3830	3.1788	1.6502	0.247	131	13-Dec	00:14	x	x		
6	6	3810	3.1784	1.651	0.249	127	13-Dec	00:20	x	x		
7	7	3810	3.1784	1.651	0.249	127	13-Dec	00:20				
8	8	3790	3.177	1.651	0.25		13-Dec	00:24	x	x		
9	9	3790	3.177	1.651	0.25		13-Dec	00:24				
10	10	3766	3.176	1.648	0.25		13-Dec	00:28	x	x		
11	11	3766	3.176	1.648	0.25		13-Dec	00:28				
12		3724	3.175	1.647	0.251	115	13-Dec	00:34	x	x		
13		3724	3.175	1.647	0.251	115	13-Dec	00:34				
14		3675	3.173	1.645	0.257	105	13-Dec	00:40	x	x		
15	15	3675	3.173	1.645	0.257	105	13-Dec	00:40				
16	16	3625	3.17	1.64	0.255	89	13-Dec	00:45	x	x		
17	17	3625	3.17	1.64	0.255	89	13-Dec	00:45		x		
18	18	3575	3.169	1.639	0.256	75	13-Dec	00:51	x	x		
19	19	3527	3.167	1.638	0.255	69	13-Dec	00:56		x		
20	20	3474	3.165	1.638	0.247	75	13-Dec	01:00	x	x		

Cast: V16A-01 **Lat deg** **Lat min** **Long deg** **Long min**
Location: 15.5 Vent Field 15 28.893 144 30.4

Ros. Pos.	Bottle#	Depth	C	T	LSS V	ORP	Date UTC	Time hhmm UTC	CH4/H2	Nutrients	Micro-bio	Save H2O
21	21	3425	3.162	1.632	0.248	79	13-Dec	01:04	x	x		
22		3200	3.154	1.635	0.245	91	13-Dec	01:13	x	x	x	x
23		3200	3.154	1.635	0.245	91	13-Dec	01:13			x	
24		3200	3.154	1.635	0.245	91	13-Dec	01:13		x		x

Cast: V16A-03 **Lat deg** **Lat min** **Long deg** **Long min**
Location: LavaFlow 15 24.376 144 30.4

Ros. Pos.	Bottle #	Depth	C	T	LSS V	OR P	Date UTC	Time hhmm UTC	CH4 /H2	Nutrients	DO C
1	1	4138	3.192	1.6795	0.075	168	13-Dec	08:38:00	x		
2	2	4138	3.192	1.6795	0.075	168	13-Dec	08:38:00			
3	3	4138	3.192	1.6795	0.075	168	13-Dec	08:38:00			
4	4	4035	3.188	1.673	0.075	167	13-Dec	08:46:00	x		
5	5	4035	3.188	1.673	0.075	167	13-Dec	00:00:00			
6	6	3551	3.167	1.635	0.075	168	13-Dec	09:00:00			
7	7	3551	3.167	1.635	0.075	168	13-Dec	09:00:00	x	2	2
8	below	160					13-Dec	10:29:18	x		
9	below	150					13-Dec	10:30:33	x		
10	lower edge	145						10:30:07	x		
11	lower edge	140						10:31:32	x		
12	in max	135						10:32:05	x		
13	in max	130						10:32:35	x		
14	in max	125						10:33:09	x		
15	in max	120						10:33:43	x		
16	in max	110						10:34:46	x		
17	upper edge	100						10:35:58	x		

2pH, major, TM

Cast:	V16A-03	Lat deg	Lat min	Long deg	Long min												
Location:	LavaFlow	15	24.376	144	30.4	Ros. Pos.	Bottle #	Depth	C	T	LSS V	OR P	Date UTC	Time hhmm UTC	CH4 /H2	Nutrients	DO C
						18	in mix layer	54						10:38:00			

collected deepwater samples for nutrients, DOC, TM, majors, pH/Alk

Cast:	V16A-04	Lat deg	Lat min	Long deg	Long min												
Location:	Seamount	16	18.62	144	56.9	Ros. Pos.	Bottle#	Depth	C	T	LSS V	ORP	Date UTC	Time hhmm UTC	CH4/H2	Nutrients	DOC
						1	1	2075							x		
						2	2	2075									
						3	3	140							x		
						4	4	134							x		
						5	5	130							x		
						6	6	125							x		
						7	7	120							x		
						8	8	115							x		
						9	9	110							x		
						10	10	105							x		

No sign of any plume on this cast. Sampled chlorophyll max for H2/CH4

4.5.2 MAPR Data

In addition to the profiles extracted from the MAPR records for each ROV dive, the MAPR data (turbidity anomaly (Δ TU), ORP anomaly (Δ E), and in-situ temperature) have been added to Fledermaus scene files that also contain the 2015 CTD tow and Sentry/MAPR data. These files are available in conjunction with this cruise report at:

- <https://www.pmel.noaa.gov/eoi/marians/scenes/2016-Falkor/15N-2015-2016-WaterColumnData.scene>
- <https://www.pmel.noaa.gov/eoi/marians/scenes/2016-Falkor/17N-2015-2016-WaterColumnData.scene>
- <https://www.pmel.noaa.gov/eoi/marians/scenes/2016-Falkor/18N-2015-2016-WaterColumnData.scene>

The files have been created in Fledermaus version 7.5.1, 64 bit version, and can be viewed with the free application iView4D available from QPS: (<http://www.qps.nl/display/fledermaus/iview>).

Of the 14 successful ROV dives, full MAPR data records were recovered from all of the Mariana back arc sites (dives S37 through S49). No data was recovered from the Daikoku dives (S34 and S35). The optical backscatter sensor was obstructed during dive S36 at Chamorro, but data from the other sensors (pressure, temperature and ORP) is of good quality.

Of particular interest, for dives where it appears considerable time was spent sampling at one location, the ORP sensor appears to reach relatively steady values, which implies the electrodes had reached equilibrium and determining an actual Eh value may be possible. There were significant differences in the value reached at different sites: Illium, Burke and Perseverance reached values of about -67 mv, while values at Hafa Adai were significantly lower at -125 mv. There was some variability in the ORP value from the MAPR that was deployed on the seafloor for ~2.4 days at Hafa Adai as part of the biology experiment, but values varied in a relatively narrow range of -130 to -150 mv.

It will be necessary to evaluate the MAPR data from the ROV dives in the context of what was happening during the dives to properly evaluate the many signals that are present throughout each record.

One other accomplishment during this cruise was the addition of real-time monitoring of MAPR data during the ROV dives. This is a new capability, in its early stages, but the first attempt was reasonably successful and future improvements to the supporting software and procedures will make this more reliable and user-friendly, and will greatly expand the functionality of MAPRs.

We expected that the real-time MAPR data (especially the ORP signal) would help to find vent sites with the ROV by detecting 'invisible' water column signals before we could see the vent sites with the cameras. The MAPR ORP sensor did detect a hydrothermal signal at the 15.4°N lava flow in areas covered with thick sediments with no visible sign of fluid flow. However, while searching for vents in the 15.5°N Perseverance area, no ORP signal was detected until well after we had seen cloudy water and arrived at vent sites, apparently because we were approaching from the up-current direction (from the south). The 2015 plume sections at 15.5°N indicate net current flow to the north.

4.6 Multibeam Sonar Mapping

Susan G. Merle, Oregon State University

The R/V *Falkor*'s EM302 multibeam sonar system acquired bathymetric data during transits and between ROV dives. The focus was to expand upon the multibeam data collected in the backarc region in 2015 on the *Falkor* (FK151121) and on earlier 2016 surveys with the NOAA ship *Okeanos Explorer* (EX1605) (Figures 4.6-2 – 4.6-4). Prior to 2015, there was scarce multibeam coverage in the central and northern backarc. A recent compilation showing all the multibeam data in the Mariana area is presented here (Figure 4.6-1).

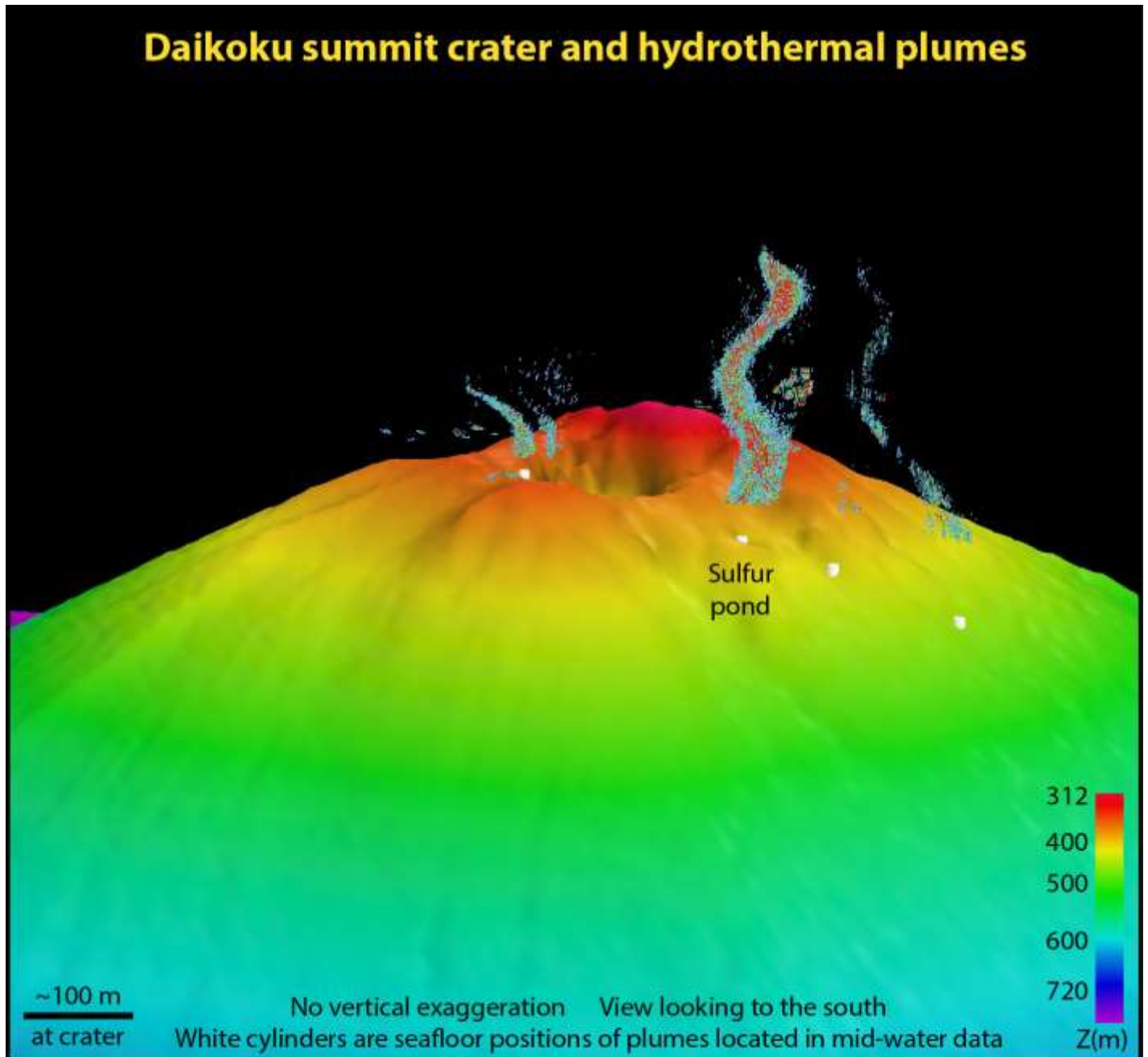


Figure 4.6-6 Water column data collected at Daikoku Seamount showing 5 areas of venting.(S.Merle)

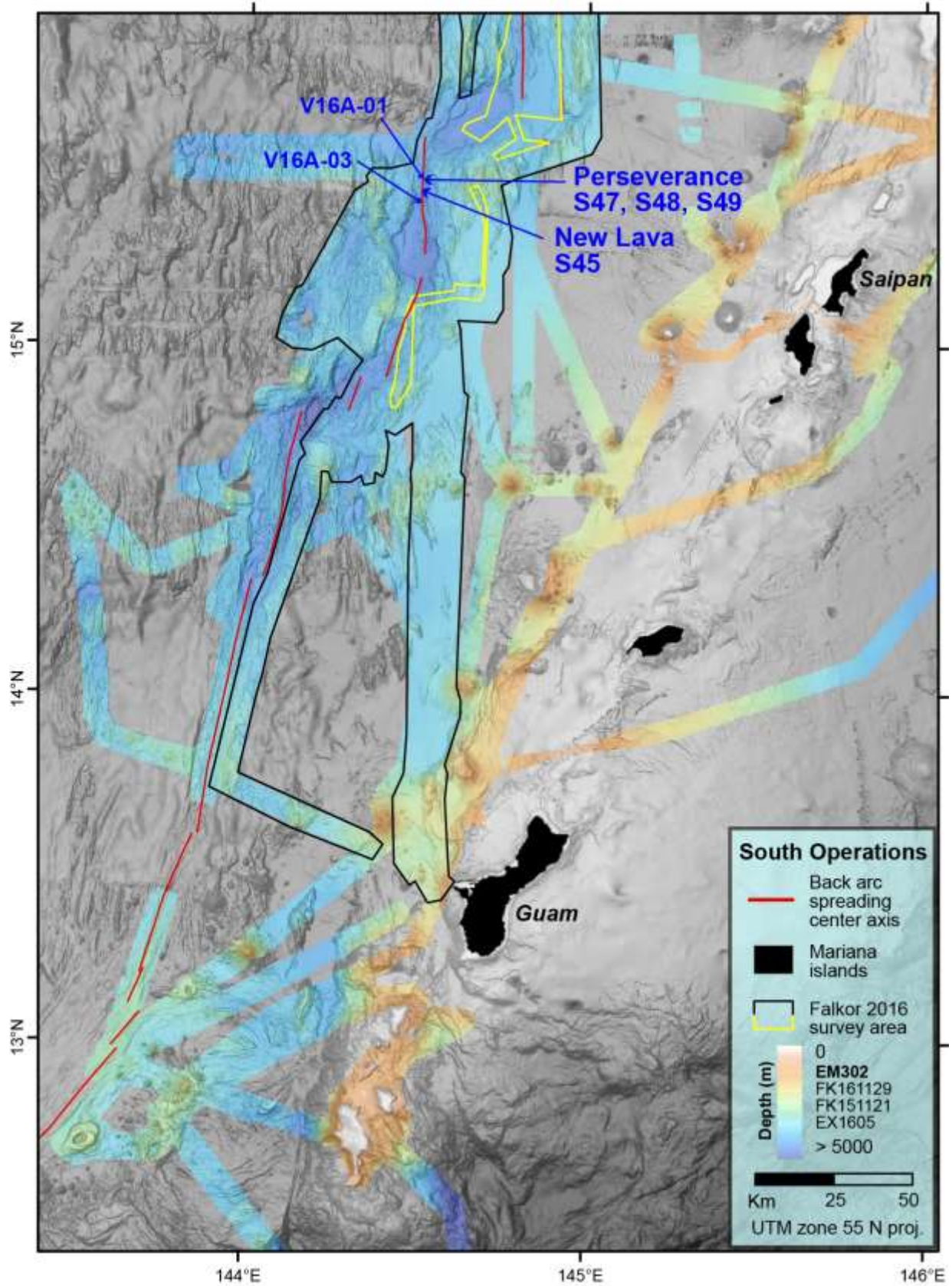


Figure 4.6-2 South area EM302 multibeam data compilation. (S.Merle)

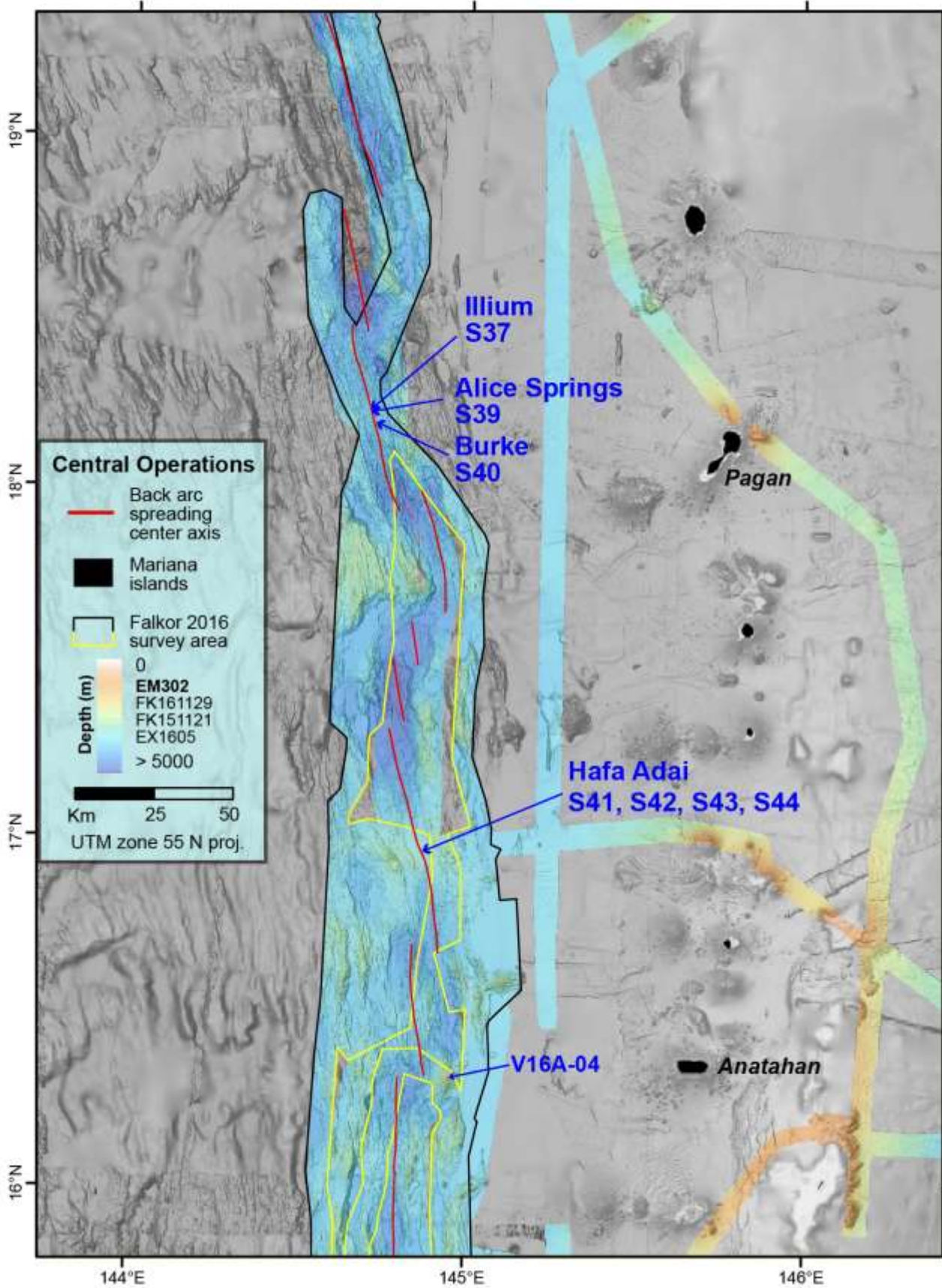


Figure 4.6-3 Central area EM302 multibeam compilation.(S.Merle)

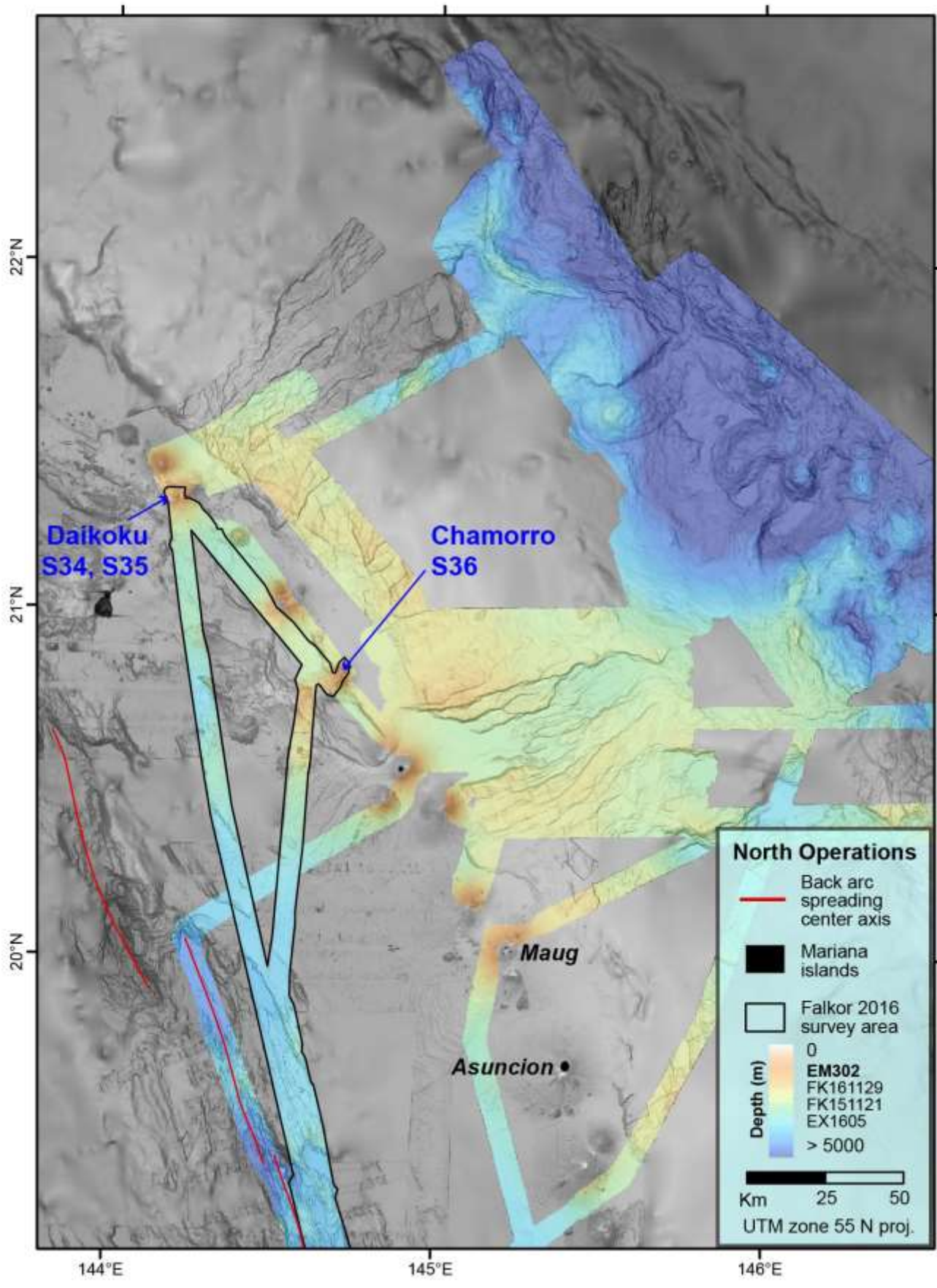


Figure 4.6-4 North area EM302 compilation.(S.Merle)

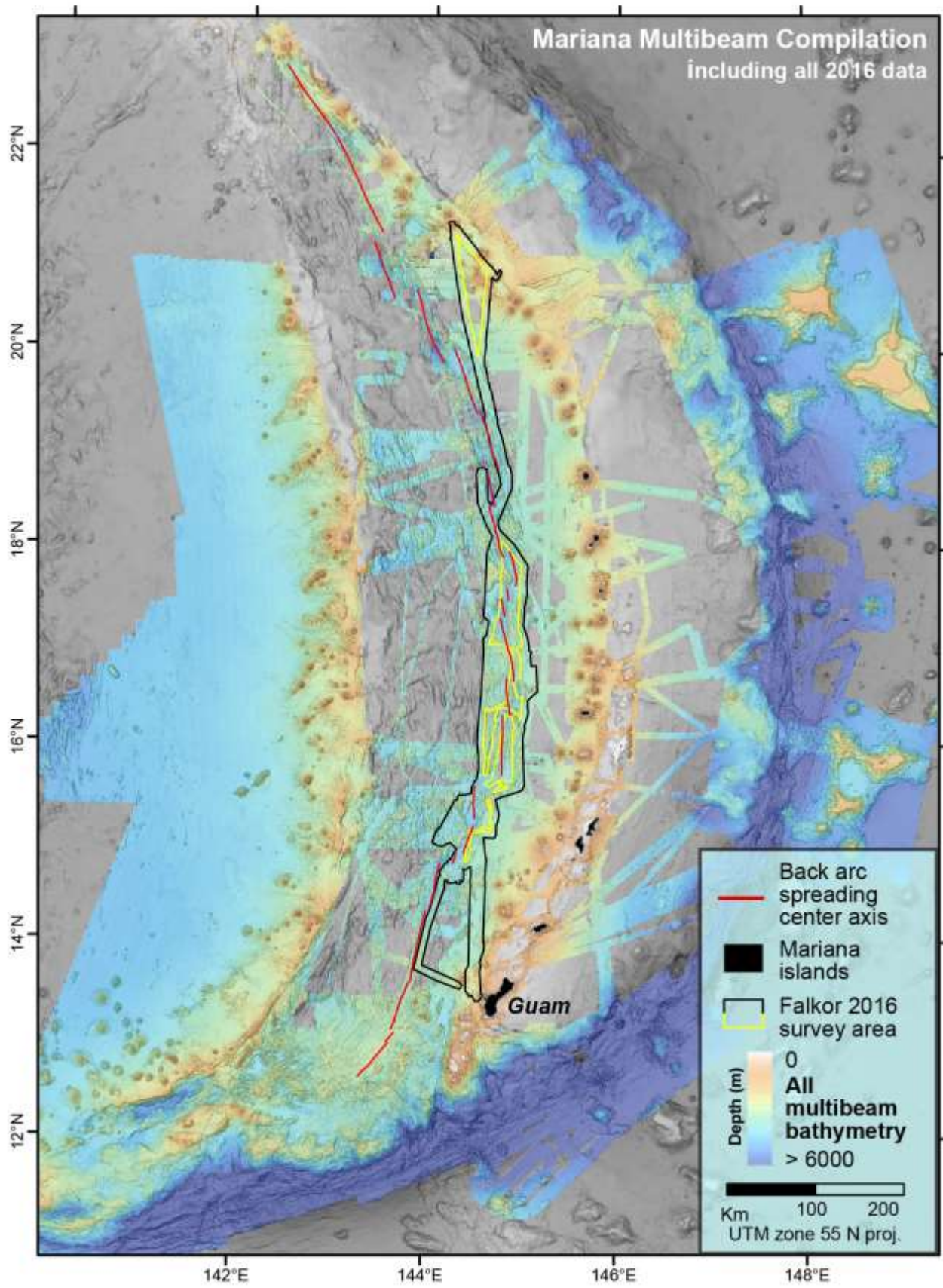


Figure 4.6-5 Compilation of all multibeam bathymetry in the Marianas region.(S.Merle)

During the 2016 *Falkor* expedition, 23,035 km² of seafloor was mapped, extending 880 km from south to north. There were large areas of extremely noisy data due to rough seas (Figure 4.6-5). Most of the bathymetry data were recoverable. On the other hand, when the weather was good the data were excellent.

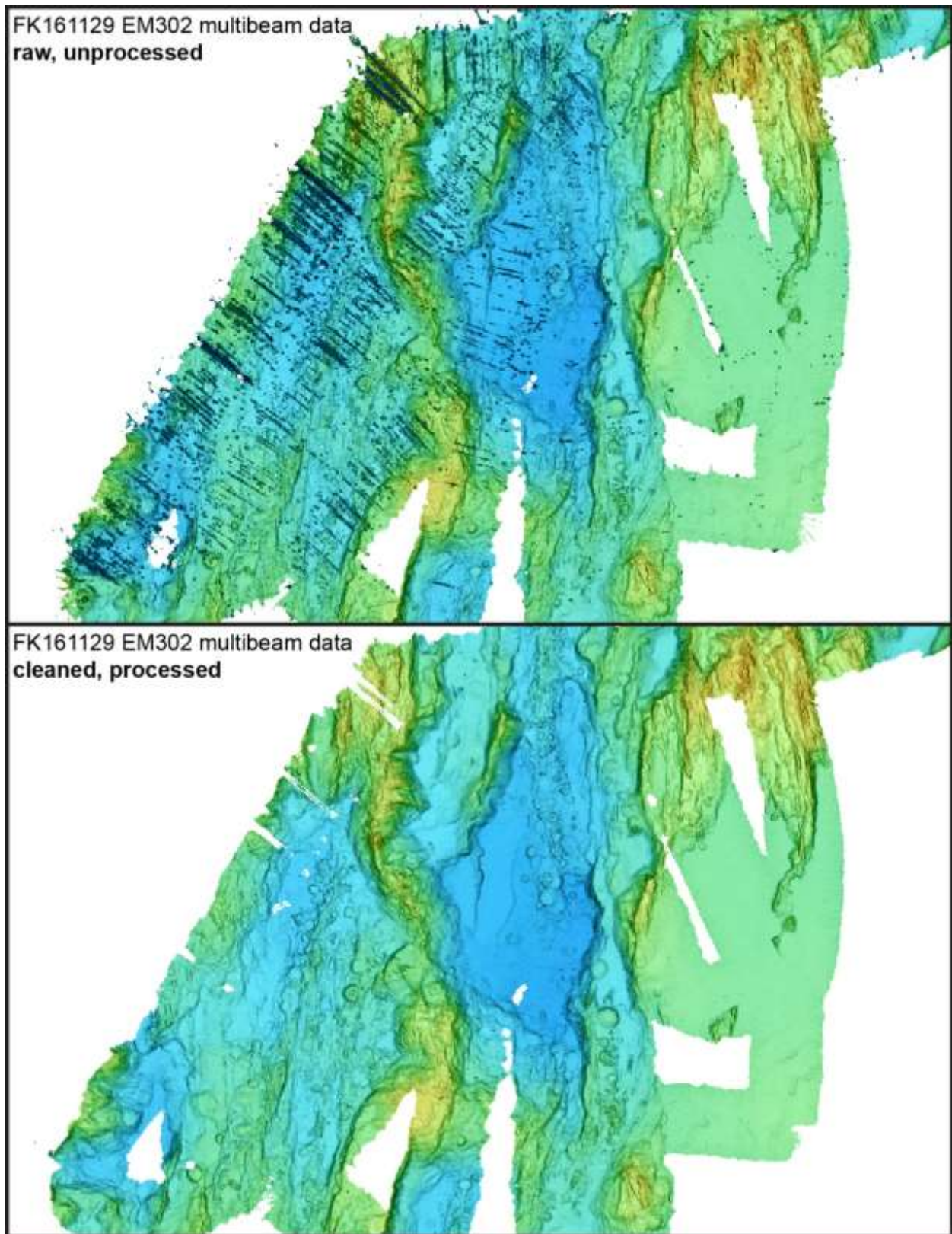


Figure 4.6-6 Examples of multibeam collected in rough seas, before and after processing. (S.Merle)

A slow speed (< 3 knots) seafloor/water column survey was conducted at Daikoku, the result of which was a 10 meter resolution grid of the seamount summit area (Figure 4.6-6). Analysis of the water column data resulted in the identification and geo-location of 5 areas of venting in and near the summit crater. 2 of those venting sites, located west of the sulfur pond, had not been previously known and have never been visited with an ROV.

Bathymetric data collected on the *Okeanos Explorer* and the *Falkor* in 2016 were surface differenced at specific sites (Daikoku, Eifuku, Chamorro, NW Rota-1 and Esmeralda), comparing the 2016 data with older data sets to look for any changes in the seafloor. No depth changes were discerned.

4.7 Outreach

Bill Chadwick and Thom Hoffman

Similar to last year's *Falkor* cruise (FK151121), Bill Chadwick coordinated the outreach activities for the science party and we were fortunate to have Thom Hoffman again from the UK as our on-board videographer. This year, Thom took the lead on writing most of the blog posts for the SOI web site and collecting all the images and video clips. This year's cruise web site was:

<https://schmidtocean.org/cruise/searching-life-mariana-back-arc/>

Our *Falkor* cruise was also featured on the NOAA/OER web sites:

<http://oepreview.nos.noaa.gov/explorations/16marianabackarc/welcome.html>

to highlight the coordination between the ROV dives by *Okeanos Explorer* and *Falkor*.

Table 4.7-1 Cruise Logs available at: <https://schmidtocean.org/cruise/searching-life-mariana-back-arc/#cruise-log>

Date	Cruise Log
12/20/2016	Searching for Life - Expedition Highlights Review
12/16/2016	Hydrothermal Hunt: From 'Wow!' to 'Why?'
12/15/2016	Mighty Microbes of the Deep Ocean
12/14/2016	Searching fo Life - Week Two Highlights - First Views
12/12/2016	A Look into Chimneys - Insights from the Hydrothermal Hunt
12/10/2016	The Animal Life of the Mariana Back-arc
12/7/2016	Going deeper: The Mariana Back-arc
12/6/2016	Searching for Life Week One - The Story So Far
12/5/2016	Insights from Daikoku Seamount
12/4/2016	Daikoku Dive 2: Sulfur so good
12/3/2016	Return to Daikoku
11/29/2016	Setting sail on the Hydrothermal Hunt

Before the cruise left Guam, Bill Chadwick gave a talk at the POETS Club, the weekly lecture series at the University of Guam Marine Lab (accompanied by Verena Tunnicliffe to help answer questions). At sea, one new feature this year was that *Falkor* was equipped to stream live ROV video to shore via the SOI YouTube channel. Thom Hoffman and individuals from the ship's crew and science party interacted with the public during ROV dives via social media.

Consequently, all the video from our ROV dives is available in a playlist for FK161129 on-line at this URL:

<https://www.youtube.com/user/SchmidtOceanVideos/playlists>

Other organizations made use of this live video feed. For example, Underwater World, a public aquarium in Guam in Tumon Bay, featured the ROV video in their "See it here live" section.



Figure 4.7.1 “See it here live” at the Tumon Bay Aquarium in Guam.

Similarly, the popular web site “I Love F***ing Science” (with 50 million followers worldwide) featured our live ROV video on their Facebook page for 4 hours, and it was viewed by 2.4 MILLION people, with over 22,000 watching at the same time at the peak!!! Incredible!

Like Message Share More

I fucking love science was live.

Check out this LIVE stream of a dive into the Mariana Back-Arc near Guam, where robot ROV SuBastian is exploring newly discovered underwater volcanoes, hydrothermal vents, and underwater life. The stream will appear blue for a short time before SuBastian reaches the ocean floor, at an incredible depth of 3290m. There's a chance we'll see some high temperature 'Black Smoker' vents, so stay tuned.

A huge thanks goes to our friends at Schmidt Ocean Institute for sharing this LIVE stream of their research mission with us!

2.4M Views
41K Likes 17K Comments 9.5K Shares

Share

Figure 4.7.2 Example of the number of viewers on “I Love F***ing Science”.

In addition, similar to last year, we conducted 13 interactive ship-to-shore video calls (Table 4.7-1) to teachers and classrooms from Guam, Oregon (part of the Oregon Coast STEM Hub), and the east coast, as well as to a public audience at the Hatfield Marine Science Center in Newport, Oregon. One call in particular with EarthEcho International (a marine education organization created by Philippe Cousteau) had 2700 students watching from around the world. Julie Huber and Verena Tunnickliffe from the science party and John Dunn from the ROV helped with these video calls.

Chadwick also helped craft the SOI press release about the cruise and interacted with numerous journalists during and after the cruise who wrote stories about its findings.

Carlie Wiener, Holly Lauridsen, and Logan Mock-Bunting (SOI shore-side outreach specialists) were extremely helpful in coordinating all of the above cruise outreach activities from shore.

Table 4.7-2 Ship to shore video call log.

Group /School	Grade	Contact	Connection	Date	No. Students
Tiyan High School (Guam)	Gr 10-12	Alicia Whitaker	Hangout	Monday December 5	3 classes; 90 students
Oregon Coast STEM Hub: Millicoma School	Gr 5-6	Cait Goodwin/Cody Carlson	Hangout	Monday December 5	30-80
Oregon Coast STEM Hub: Crestview Heights	Gr 5-6	Cait Goodwin/Faith Forshee	Hangout	Monday December 5	86
Oregon STEM Hub: Taft High/Middle	Gr 7-8	Cait Goodwin/Mary Parnell	Hangout	Tuesday December 6	60
Oregon STEM Hub: Sunset	Gr 7-8	Cait Goodwin/Shirley Tremel	Hangout	Tuesday December 6	90
Oregon STEM Hub: East Elementary	Gr 5-6	Cait Goodwin/Caryn Sutter	Hangout	Tuesday December 6	30
Annalisa Bracco Kindergarten	SK	Annalisa Bracco/Jessie Metaferia	Hangout	Wednesday December 7	21
Earth Echo	Gr. 6-8	Stacey R' stacey@earthecho.org	Hangout	Wednesday December 7	2700
Oregon STEM Hub: Newport High School	Gr 9-12	Cait Goodwin/Liz Fox/Dave Campbell	Hangout	Thursday December 8	50
Oregon STEM Hub: Jewell School	Gr 9-12	Cait Goodwin/Don Anderson	Hangout	Thursday December 8	30
War in the Pacific National Historical Park (Guam)	Public	Art Davtian	Hangout	Saturday December 10	55
Hatfield Marine Science Center	Public	William Hanshumaker	Hangout	Saturday December 10	30
Simon Sanchez High School (Guam)	Gr 10-12	Melanie Blas	Hangout	Friday December 16	3 classes; 75 students

5 - ROV Imagery and Video Notes

ROV SuBastian data logging, imagery, and video recording systems

Bill Chadwick

During FK161129, ROV *SuBastian* used the IRLS logging system (adapted from *ROPOS*) for both data logging and capturing video frame grabs. ROV video was recorded in the control room on *R/V Falkor* in several formats. Since this was the first science expedition for ROV *SuBastian* on *R/V Falkor*, there were many things about the data logging, frame-grab capturing, and video recording system that were “not yet ready for primetime”. This section describes the state of the logging system, and the imagery and video recorded during the cruise.

Table 5-1 Summary of the number of framegrabs (logger-captures) for each ROV *SuBastian* dive.

Dive number	Number of framegrabs	Filenames
S34	369	Mix of epoch time & sequential
S35	605	Mix of epoch time & sequential
S36	105	Mix of date/time & sequential
S37	493	Mix of date/time & sequential
S39	603	Mix of date/time & sequential
S40	796	Mix of date/time & sequential
S41	1326	Mix of date/time & sequential
S42	843	Mix of date/time & sequential
S43	986	Mix of date/time & sequential
S44	616	Mix of date/time & sequential
S45	444	Mix of date/time & sequential
S47	557	Mix of date/time & sequential
S48	128	Mix of date/time & sequential
S49	327	Mix of date/time & sequential
TOTAL	8198	

In addition, there were a few time intervals when all the 1Hz framegrabs were saved for a limited time interval of interest. These files had to be copied manually and are not included in the totals above.

Table 5-2 Summary of the cumulative file size of video recorded for each ROV *SuBastian* dive.

Dive number	4K Highlights (GB)	HD Continuous (GB)	H.264 Continuous (GB)
S34	361	472	7.62
S35	322	552	17.06
S36	107	182	none
S37	273	471	7.49
S39	255	664	20
S40	170	717	12.66
S41	696	863	15.28
S42	360	877	20.23
S43	254	848	14.28
S44	172	691	12.32
S45	25	362	6.08
S47	37	1300	5.97
S48	0.073	32	1.1
S49	80	397	6.32
TOTAL	3112	8428	146.41

IRLS logging system

- The IRLS logging system on *Falkor* was set up to interface with a frame grabber operating in the background that collected a framegrab every second. For each log entry, the logger had the choice of picking a framegrab to go with it.

This image is saved in the IRLS folders at two resolutions (see below). At the end of a dive, the “unused” framegrabs are “purged” (deleted), and only those associated with a log entry are saved.

- We discovered there is a timing ambiguity in IRLS under some circumstances. When you first create a new observation, it creates an "observation time", and it selects navigation & sensor data at the same time. If you happen to select an image created at the same time as the "observation time" (the time you clicked "create a new observation"), everything is fine. But if you select an image captured at a different time, all the navigation & sensor data are changed to correspond to the image time. However, the problem is that the "observation time" is not changed. So when you output data, the "observation time" does not correspond with the sensor data (the sensor data recorded were not collected at the "observation time").

- One of the many recommendations we have made to SOI is to add an option in IRLS on the logging screen to take a frame grab immediately, without going to a secondary page and having the option to add text and switch images, etc. Another is to enable taking a framegrab automatically at a set time interval.

- Another quirk about IRLS is that it gives you the option of outputting to HTML or CVS files. When you output to HTML directly from IRLS, you do not get the full resolution framegrab files, you only get a lower resolution “x-large” files, which are 1920x1080 and typically 200-500 Kb in size. Another recommendation would be to have the full-resolution framegrabs (3840x2160 and 1-3 Mb in size) available and linked to the HTML output from IRLS. You only save the full resolution framegrabs when the IRLS administrator outputs the dives as a “data package” at the end of the cruise, then they are in the IRLS>DiveXX>framegrabs folder. This folder was not available on the public directory during the expedition and would be useful for individual scientist interested in particular imagery. A future update should include creating these directories automatically after each dive and making them available at sea.

Still imagery (video frame-grabs)

- There was no independent digital still camera for recording still images.

- The GMT date and time was not consistently used as the filenames for the video frame grabs in the IRLS system. Dives S34-S35 only have date/time info in a few of the filenames, and those are in “epoch time” (= unix time), which is seconds since January 1, 1970 UTC (like 1480635684132S5K09846.jpg, which includes 3 milliseconds digits, followed by “S5K” and a sequential file number). Other filenames only include the S5K sequential file number. The rest of the ROV dives, S36-S49, have date/time info in about half of the filenames and the rest just have the S5K sequential file numbers as filenames. For the image files that do not have date/time info in the filenames, one would have to refer back to the IRLS logs to get that information.

- For a few of the dives, we requested that all the 1-second framegrabs be saved for certain time intervals, for example during the deployment and recovery of the temperature array at Voodoo vent. These amounted to tens of thousands of images, which seems more than is reasonable, so we suspect multiple images were saved for each framegrab or images were captured at faster than 1 Hz by the frame grabber. This makes for a confusing array of framegrab files in the IRLS data packages.

- For our cruise it is very difficult to find the full-resolution image files that correspond to the images files in the HTML output because of all the filename irregularities and the intervals with huge numbers of images.

Video recordings

- ROV video (generally from the 4K Science camera) was recorded in several formats to video recorder decks in the ROV control room. Because of large file sizes, full 4K resolution video (3840 x 2160 pixels and about 200 Gb/hr) was only recorded as short highlights when the video logger turned the recorder on/off. HD resolution video (1920 x 1080 pixels) was recorded continuously in Apple ProRes422 format (at a data rate of ~50-100 Gb/hr). This is the same format as ROV *Jason* records highlights in usually. We had requested that ROV *SuBastian* video also be recorded continuously in a more compressed H.264 format (1920 x 1080 but a data rate of only 1-2 Gb/hr, similar to ROV *Jason*), but it was not possible to implement this properly before the cruise. We attempted to transcode the video from HD to H.264 in realtime during the cruise, but the computer doing the transcoding could not keep up. Consequently, the H.264 files have periodic temporal “hic-ups” in which the video pauses and then speeds up, making them jittery, and the files have no timecode or audio.

- Originally, there was no timecode being recorded to any of the video formats. For most of the dives, timecode was embedded in the 4K and HD video files, but not in the H264 files. Likewise, eventually control room audio from the headset by the “hot seat” was included with the 4K and HD video, but not the H264 video.

- The GMT date and time was not used as the filenames for the 4K and HD video files, but was able to be used for most of the H264 video files (because of an optional feature in the transcoding software). The 4K and HD video filenames are generally sequential, but are not consistent.
- Video file lengths were short and variable for the 4K highlight clips. The HD and H264 continuous video files were about (but not exactly) an hour, and were started and stopped manually by the video logger, because there was no automated system in place to make smaller, more manageable file sizes (for example, ROV *Jason* makes 15-minute H264 files).
- The auto-iris and auto-ISO controls on the Science Camera were not working during the cruise, and were not easy to change manually, so the video is often too light or too dark during the earlier dives. Eventually, manual controls were added to a portable keyboard to allow scientists in the control room to change them more easily, and to operate the pan/tilt/zoom controls with a joystick.

Table 5-3 Video 4K Highlight log

Highlight	Time ON	Time OFF	Description
S34 - Daikoku			
1	21:48	22:16	First look at bottom. Near Fish Spa. White smoker, sediments with mat. Lots of fish.
2	22:46	22:59	Pele's tears of sulfide during sampling; sediment close-up; sampling area with fish.
3	00:07	00:14	Start of HFS-04 sample. Close-up of sediment, sulfur, crabs.
4	00:17	00:22	Crab on sampler and Verena talking about it during HFS-05.
5	00:27	00:29	Crab and vent fissure with yellow sulfur; bubbles and white smoke.
6	00:35	00:40	Site of HFS sample -04,-05,-06. Larger view, chimney.
7	00:42	00:42	Crab on sulfur chimney.
8	00:55	01:02	While scooping sulfur chimney.
9	01:16	01:23	White geo sample.
10	02:37	02:38	Sampling of sulfur crust but not in focus.
11	02:39	02:40	Sampling of sulfur crust (try again). Also not great.
12	02:41	02:43	Sampling of overhanging sulfur crust, take 3. Success!
13	02:57	03:01	Looking for sulfur pond. At bottom of smoking pit? Black but hard to tell.
14	03:07	03:10	Other side of overhang by MKr-132. Great sulfur layering.
15	03:24	03:25	Different fish, replacing fish trap after recovery from rolling downhill.
16	03:57	04:00	Strings of sulfur falling down and smoky waters. Pick up fish trap. Don't know if captured any sulfur falling.
S35 - Daikoku			
1	22:04	22:10	Lots of fish-some crabs on ash covered slope with scattered sulfur crust, smoky white plume. First area on bottom.
2	22:23	22:46	Sulfur finger chimneys by small venting crater and fissure. Fish and crabs again. Near initial landing spot.
3	23:13	23:15	Close-up of sediments and fish.
4	23:16	23:19	Sulfur bubble and strands in sediment.
5	00:15	00:17	<i>SuBastian</i> grabbing HFS with fish trap in background.
6	00:44	00:50	<i>SuBastian</i> deploying second fish trap.
7	02:41	02:45	Sampling tubeworms ~20m NE from waypoint 2. Not successful.
8	03:10	03:12	Tubeworm.
9	03:25	03:35	Tubeworms.
10	05:11	05:15	Fissure with bubbles, sulfur, crabs, fish. Getting HFS ready.
11	05:44	06:05	Same fissure. Molten sulfur droplet ejecting out.
12	06:09	06:09	Got smoked out.
13	06:13	06:30	Molten sulfur ejected and crab. SO COOL!!

Highlight	Time ON	Time OFF	Description
S36 - Chamorro			
1	23:54	00:07	White chimney when first on bottom.
2	00:10	00:12	Squat lobster.
3	00:26	00:38	Sampling chimney.
4	00:43	00:48	HFS from chimney base.
5	01:00	01:01	HD recording stopped working. See a little at bottom.
S37 - Illium			
1	01:50	01:55	Flow with snails.
2	01:57:20	02:01:22	At Illium vent field. Diffuse vent with snails.
3	02:02:15	02:06:25	Deployment of robosnail.
4	02:12	02:40	Critters crawling around vent while sampling.
5	02:40	02:52	New view of same scene.
6	03:37	03:50	Temperature probe by robosnail.
7	03:55	04:00	Scoop sample of snails and shrimp.
8	04:03	04:12	Suction sample of little things on surrounding rock.
9	04:14	04:19	Thom's overview filming of whole area. Crabs fighting.
S39 - Alice Springs			
1	03:07	03:29	First shimmering vents. Lots of anemones, mussels, squat lobsters and barnacles.
2	03:47	03:48	Red shrimp floating by. Not a great shot though.
3	03:55	03:59	Another low temp vent up the hill with snails.
4	04:02	04:05	Higher flow area from the same seep.
5	05:08	05:20	Gas tight sample.
6	06:49	06:52	Crabs.
7	06:54	07:02	Crab fight: cannibalism.
8	07:33	07:46	Sampling snails.
9	08:13	08:19	Imaging anemone field near diffuse venting.
10	08:21	08:22	New area of venting. Moving up vertical wall with active venting.
11	08:23	08:25	A lot of venting.
12	08:53	08:58	Venting wall to white unknowns.
S40 - Burke			
1	00:22	00:28	Milky crack area.
2	00:36	00:42	Next venting site. With snails (First Snails nav marker)
3	01:04	01:11	Approaching First Snails again.
4	01:37	01:40	Deploy robosnail.
5	01:41	01:48	Suction sampling of shrimp.
6	01:54	01:58	Suction sample 2 (midway) of macro-fauna.
7	03:22	03:26	Snail pits- shrimp, snails, crabs, anemones.
8	03:36	03:45	Barnacles cirri.
9	03:46	03:50	Close-up of area again.
10	04:09	04:11	Suction sampling snails.
11	04:27	04:30	Milky crack, squat lobster and anemone.
S41 - Hafa Adai			
1	23:05	23:57	First large chimney with smoking flanges. Sample geo-01.(Two Towers)
2	0:01	00:06	Approaching flange again.
3	0:46	00:58	Temperature attempt at top of black smoker.
4	1:08	01:11	Approaching next chimney.
5	1:12	01:28	Again-approaching next chimney.
6	2:31	02:50	Suction sampling bio-03.
7	3:02	03:12	Suction rock faces bio-05.

Highlight	Time ON	Time OFF	Description
8	3:12	03:15	Looking around.
9	3:34	03:50	Looking around and sampling chimney.
10	04:02	04:09	Sampling chimney at second site.
11	04:10	04:43	Highlight while surveying second chimney (WP-02 Sequoia)
12	04:49	04:54	Chimlets at WP-03 (Chimlet Garden)
13	05:27	05:30	WP-04 chimney. (Alba)
14	06:15	06:19	WP-06 crater approach (Voodoo).
15	06:31	06:37	High concentration of snails area in crater.
16	06:53	07:00	Chimneys at WP-07.
17	07:04	07:07	Chimneys just past WP-07. Sample white snails and old chimney?
18	07:11	07:19	Sampling white snail and old chimney.
19	07:21	07:25	Sample old chimney.
S42 - Hafa Adai			
1	23:06	23:12	Temperature recording before hula hoop.
2	23:12	23:28	Deploying hula hoop.
3	02:05	02:07	
4	02:08	02:10	Hula array leaving site.
5	02:11	02:13	Entering snail graveyard
6	02:14	02:37	Suction sampling snail shells.
7	03:02	03:04	Venting NW rim of cinder crater (Voodoo)
8	03:05	03:08	Mkr-171 fly-over.
9	03:27 (?)	03:35	Sheet flow with drain-out feature. Rock sample.
10	03:44	03:53	Approaching Sequoia.
11	04:20	04:22	Close-up while sampling Sequoia.
12	04:55	05:05	Again-approaching Sequoia and geo-20.
13	05:36	05:36	Sea cucumber floating by.
14	06:47	06:50	Sequoia overview.
15	07:17	07:33	New chimney site.
S43 - Hafa Adai			
1	01:40		Alba chimney.
2	01:59		Crab grab of shrimp.
3	02:02		Critter close-up.
4	02:20		Around Alba.
5	02:47		Highlights on.
6	06:20		SPME sampling.
7	06:46		First pass of biology survey of Sequoia.
8	07:09		Second pass of biology survey of Sequoia.
9	07:28		Third pass of biology survey of Sequoia.
S44 - Hafa Adai			
1	01:45	01:49	Overview of Mami Wata
2	02:24	02:28	Mami Wata biology.
3	02:41	02:41	Mami Wata white patch.
4	02:51	02:58	WP-07 area.
5	03:23	03:29	Two Towers.
6	03:29	03:32	Two Towers, different side.
7	03:32	03:35	Two Towers, different side continued.
8	03:37	03:38	Top of Two Towers, black smoke.
9	04:01	04:02	Top of Two Towers with HFS.
10	04:02:40	04:03:40	Top of Two Towers with HFS.
11	04:07	04:08	Fluid sampling top of Two Towers.

Highlight	Time ON	Time OFF	Description
12	04:11	04:14	Biology close-up while fluid sampling at top of Two Towers.
13	05:21	05:27	Highlights on/off.
14	05:41	05:53	Highlights off; temperature array.
S45 - New Lava Site			
1	01:45	01:50	Slope of lavas.
2	01:53	01:56/57	Iron staining; fractured pillow. (2 highlight pieces).
S47 - Perseverance			
1	06:22	06:23	Old sulfide/oxide crust.
2	07:17	07:18	Venting area.
3	07:20	07:23	Venting area again.
4	07:40	07:50	Close-up of critters.
5	08:19	08:21	<i>Paravinella/Shinkai</i> limpets.
6	08:51	08:54	<i>Paravinella</i> ; worms; limpets; high-flow.
7	10:13	end of dive	Permanent highlights on due to complete power outage in control room.
S48 - Perseverance			
no highlights			
S49 - Perseverance			
1	02:37	02:38	Circling Stump of Mystery.

Recommendations to SOI after the cruise by co-chief scientist Chadwick

- Recording continuously in HD 1080p (Apple ProRes422) seems like overkill and is onerous for data management by the MTs. Too much data is generated from each dive and takes too much time to copy, transfer, and back-up between dives. Most scientists will be happy if the continuous video is saved in a compressed H264 format. This will make video data management much more efficient and less time consuming. A high priority for scientists is to get copies of the continuous ROV dive video as soon as possible after each dive, and at least multiple copies made to multiple members of the science party before the end of the cruise. Video is data to the science party and everyone wants to leave the ship with it - not wait for weeks or months for it after the cruise. For example, on this cruise the MTs are struggling to even make one copy of all the video for the science party before the end of the cruise. The total amount of video data is just unmanageable with the current set up.
- Following on the comments above, I would recommend that video highlights only get recorded in 4K and HD 1080p format (Apple ProRes422), and the continuous recording only be recorded in H264. This will greatly reduce the time and effort needed to manage (copy, transfer, backup) the video data and will allow the MTs to provide the science party with multiple copies of the ROV dive video on a dive by dive basis - a very high priority for the science party. All the video recorded should have timecode and the audio from the headset in the Control Room. Even better would be to have the option to have an overlay on the continuous H264 video (perhaps as a subtitle file) with date/time, dive number, lat, lon, depth, and heading information. In addition, all the video files should have filenames that include date and time for the start time of the recorded file, or both the start and end times.
- The video matrix was shown to be vulnerable as a single-point-of-failure, when during dive S47 the UPS in the Control Room shut down (after days of beeping) and every monitor connected to the matrix in the control room and the library went dark, right in the middle of an ROV dive with the ROV on the bottom. This took about 30 minutes to rectify and was a major disruption to the dive, including all the video recordings. Although power was not lost to the ROV, the pilots had no control information to go by for several minutes until an independent laptop with the Greensea display was brought in.
- During dive S48, the files that were recorded by the HD 1080 video recorder were black. In other words, the recorder made .mov files that were many GB in size, but there was apparently no video input into the recorders. This was the dive immediately after the incident with the video matrix going down, so may be a consequence of that. In any case, this shows the need for review and quality control of the video files after each dive and before the next dive. If this had been found more quickly, we could have saved the video recorded in the ROV container, but they had already been reformatted for the next dive. Fortunately, the H264 files still recorded, although they are gittery and do not have timecode or Control Room audio.
- In addition, there were many recommendations for improving the IRLS logging system (not reproduced here).

6 – ROV *SuBastian* Dives

6.1 Dive Statistics

Dive	Date Start	In Water	On Bottom	Off Bottom	Bottom Time H:MM	Location	notes
S34	12/1/2016	21:07	12/1/2016 21:42	12/2/2016 4:06	6:24	Daikoku	Sulfur coated ROV
S35	12/2/2016	21:32	12/2/2016 21:57	12/3/2016 7:21	9:24	Daikoku	Crater had zero vis
S36	12/3/2016	22:59	12/3/2016 23:49	12/4/2016 1:11	1:22	Chamorro	Weather ended due to winds.
S37	12/4/2016	21:38	12/5/2016 0:05	12/5/2016 4:54	4:49	Illium	Found old Alvin weights
S38							Aborted
S39	12/6/2016	00:15	12/6/2016 2:38	12/6/2016 9:10	6:32	Alice Springs	Lower temps than 1987
S40	12/6/2016	21:24	12/6/2016 23:23	12/7/2016 6:31	7:08	Burke	Small diffuse sites
S41	12/7/2016	20:58	12/7/2016 22:52	12/8/2016 7:26	8:34	Hafa Adai	Named chimneys
S42	12/8/2016	21:05	12/8/2016 22:56	12/9/2016 7:37	8:41	Hafa Adai	Deployed Hula
S43	12/9/2016	21:20	12/9/2016 23:10	12/10/2016 7:38	8:28	Hafa Adai	North exploration
S44	12/10/2016	23:43	12/11/2016 1:29	12/11/2016 8:21	6:52	Hafa Adai	Recover Hula
S45	12/11/2016	23:03	12/12/2016 1:22	12/12/2016 5:06	3:44	New Lava Flow	Weather ended dive early. Damaged cable on recovery.
S46							Aborted
S47	12/16/2016	03:46	12/16/2016 6:12	12/16/2016 13:28	7:16	Perseverance	Navigation-bathymetry mismatch
S48	12/16/2016	19:42	12/16/2016 22:02	12/16/2016 23:07	1:05	Perseverance	Telemetry problems; short dive
S49	12/17/2016	22:07	12/18/2016 2:31	12/18/2016 6:00	3:29	Perseverance	Weather on the edge

6.2 Dive Summaries

S34 Daikoku

Landed just 10m east of WP-01 (Fish Spa) on white sulfur crust, smoke and fish. Measured temperature of white sediments with ROV probe, Tmax=23.73°C. Collected 1 HFS and 2 fish suction samples at this landing site. Moved slightly west to a white smoker and gas bubbles emanating from adjacent cracks. Lost visibility and moved slightly east to take 3 HFS samples from hole emitting gas and fluids. Collected sulfur chimlet and sediment sample from this site. Returned to original landing site to deploy Fish Trap and Mkr-132 near crusty edge. Collected suction sample of fish and piece of the sulfur crust at Mkr-132. Attempted to view sulfur pit before moving to WP-04 but couldn't see sulfur pond due to poor visibility. Molten sulfur from the plume coated the vehicle. Returned to Mkr-132 and Fish Trap had rolled down hill. Recovered trap and redeployed about 12.5m SE from the marker, it contained about 2 fish. Attempted to net some fish but sulfur coating would not allow net to unfurl. Visibility decreased, recovered fish trap before ascending.

10 samples total: 2 HFS; 4 Biology; 4 Geology (including the sulfur adhered to the ROV); 2 failed HFS

S35 Daikoku

Landed on bottom just NE of WP-01 (Fish Spa). Observed small chimneys along a crack/vent leading to the edge of a sulfur pit. Deployed Fish Trap in area of white sediments with flat fish. Collected 6 HFS samples in darker sediment near this Fish Trap. Observed sulfur bubbles and strands forming. Recovered Fish Trap after sampling. Moved upslope, away from pit, to area with increased fish density, ~30m SE of WP-01. Deployed 2 Fish Traps at this location, one on darker sediment next to area of white sediment and the other one on darker sediments. Collected 2 HFS and one suction of fish at this site. Deployed **Mkr-133** at this site and recovered one of the fish traps that didn't have any fish. Transited south and upslope over sulfur crust populated with fish lying on sediments. Redeployed the Fish Trap in area with high fish density on a sedimented, steep slope. Deployed **Mkr-137** at this new deployment site (~50mN of WP-02). Transited to **WP-02**, inner wall of Daikoku's crater where clumps of tubeworms were observed in the rock edges. Collected ~8 tubeworms from the inside wall of the crater and then one HFS sample. Drove counter-clockwise inside crater wall and then mid-water, across crater, toward WP-03 (*Okeanos* white smoker). No visibility with wall 8m in front of ROV. Transited back to Mkr-137 site to recover the Fish Trap. No fish inside trap but observed many fish surrounding the trap. Collected a scoop of sediment from the site. Transited upslope and north to recover the second Fish Trap at Mkr-133. Followed a local ridge then over sulfur crusts and massive slabs leading to a pit. Drove over pit and found Mkr-133. Redeployed empty fish trap at Mkr-133 with the other trap. Left trap and headed back to sample the venting along a crack site at Fish Spa seen on S34. Collected 4 HFS samples. T_{max}=43.7°C while observing erupting, molten sulfur marbles. Transited back to Mkr-133 and recovered both fish traps. Collected crab sample with suction at this site. Moved west, toward sulfur pit, and collected some crabs which were more abundant here, ~12m SE of WP-01.

18 samples total: 7 HFS (6 failed); 5 biology.

S36 Chamorro

Dive began downslope of WP-01 (Venting site observed on 2016 *Okeanos* dive), in broken lava flows and small chimneys with diffuse flow. Moved upslope and began sampling small chimney at **WP-01** site with snails. Surface winds elevated to 30kts. ROV temperature wand had a high temperature of 65°C, *Okeanos* had a T_{max} of 48°C. Collected piece of small chimney with animals and 4 HFS samples (T_{max}=155.3°C). Dive ended due to winds with about 1.5 hours of bottom time.

5 samples total: 1 geology; 2 HFS (2 failed).

S37 Illium

Dive began downslope of the 1987 Illium vent site target in pillow rubble. Problems with navigation at the beginning of the dive with significant jumps in position while switching between INS and USBL. Encountered old chimneys while moving upslope through areas of intact pillows and took a geology sample of an old chimney. Moved upslope until reached target depth of old Illium. Proceeded laterally to east when found active hydrothermal venting and more old chimneys. Moved east and then west across the slope to determine range of hydrothermal deposits and then upslope along highest extent of biology and hydrothermal features. Sampled in an area with high biology concentration, **Snail Pile** site. Took 11 HFS samples, 3 biology (1 scoop and 2 suctions of snails), deployed Robosnail and **Mkr-138**. Diffuse flow with maximum temperature of 32.8°C. After sampling, followed the hydrothermal staining upslope to top of ridge which consisted of mounds of inactive sulfides, dead chimneys and an *Alvin* weight. Explored top of ridge and found no active venting but another *Alvin* weight. Ended dive after going down nose of ridge (pillow lavas) due to ROV hydraulic leak.

15 samples total: 2 HFS (9 failed); 3 biology; 1 geology.

S39 Alice Springs:

Began dive downslope of the 1987 Alice Springs location on a steep slope of pillow lava. Encountered sulfides and anemones while moving NE along the 1987 Alice Springs vent target depth. Followed sulfides upslope encountering an area of inactive chimneys. Descended back to target depth and then followed depth laterally along ridge to the east. Moved upslope and then came back to west through areas of anemones but not sulfides/chimneys. Drove back into the

sulfide zone and found diffuse flow with a crabs, squat lobsters, mussels, barnacles, scale worms and anemones. Took one HFS sample at **Diffuse Site**. Moved upslope following anemones through patches of diffuse venting and animals. Encountered focused venting site with the addition of snails to the biology, **Snail 001 Site**. Took 8 HFS, 1 gas-tight and 4 biology (1 rock with biology, 1 mussel, scoop and suction) samples and a Robosnail deployment/recovery. Deployed **Mkr-131** at Snail 001. Maximum temperature recorded was 164.8°C. After sampling, continued upslope facing the slope encountering shimmering from cracks with milky flows in some areas and high concentrations of anemones. Moved back downslope to Mkr-131 and descended deeper into old sulfides and chimney stumps. Moved upslope again toward carpet of anemones. Sampled a rock with biology in the **Little Anemone** site. Dive ended.

16 samples total: 9 HFS (1 failed); 4 biology; 1 geology (had biology); 1 gas

S40 Burke:

Dive began south and downslope of an ORP target (WP-01) from the 2016 *Okeanos* expedition. This site was also due south of the 1987 Anemone Heaven site. Climbed a pillow tube hill with staining and found some diffuse flow and few animals. As continued to climb toward the 1987 Anemone Heaven target (WP-03), observed concentrations of anemones and hydrothermal staining 22m SW of target. In this area found a bottle on a rope which looked deliberately placed as a marker. Moved north and upslope into an area with diffuse-milky flow but only sparse biology confined to a crack (**Milky Crack Navigational marker**). Followed the biology upslope into an area with mussels, shrimp, limpets, scaleworms, barnacles and crabs (**First Snails Navigational marker**). Surveyed area and then came back to area for sampling, **Snail Pit**. Deployed a Robosnail prior sampling. Collected 3 biology suction samples, 1 rock with limpets and 7 HFS samples (51°C). Recovered Robosnail and the real snails attached to it. Did a final suction of snails that had been underneath the Robosnail location. Deployed physical **Mkr-234** at this site named **Snail Pit**. Moved back over to the **Milky Crack** target area. Took 2 HFS samples in the milky crack (11°C). Long transit NW to WP-06 area up and down lava flow slopes. Just south of the waypoint came into area with hydrothermal staining and old chimneys. Primarily anemones and small shimmer with a tiny pH anomaly from the HFS sensors but no sampling.

15 samples total: 7 HFS (2 failed); 5 biology; 1 geology (with biology).

S41 Hafa Adai 17N:

Dive began in sheet flows north of the target location of westernmost chimney at WP-01, (not visited on the *Okeanos* dive) from the Sentry bathymetry. Chimney (named **Two Towers**) is an active smoker, with flanges, diffuse and black smoke venting standing 16.5m above the seafloor. Structure appears to be two chimneys joined at the base, southern side is most active. Conducted a survey from top to bottom of the chimney on its east and north sides. Sampled broken chimney-sulfides on top of a flange on east side approximately 13m above the seafloor. Measured temperature under the flange at 280°C and took one gas-tight sample. Transited east to WP-02, larger chimney (first visited by *Okeanos*) to the east, named **Sequoia**. Took a gas-tight, 3 biology suction, 2 HFS and a chimney fragment sample on west side at black smoker measured at 302.5°C near the base where chimney bulged and active venting began. Marker accidentally dropped/deployed (**Mkr-254**) while retrieving a scoop from the basket and later observed at northside of chimney base. Conducted visual survey of chimney's west side from base to top (31m) and then back down the east side. Transit to WP-03 where observed 3m chimlets (**Chimlet Garden**) and measured fluid at 20°C. Transited to next site at WP#4 (**Alba**) with 25°C fluid. Next location explored was the cone at WP-05 (**Voodoo**) where a site survey of the SE quadrant of the cone for deploying Amanda's temperature array was made. Deployed **Mkr-171** at the potential snail experiment site for a future dive. Next transited over sheet flows to **WP-07** where many chimneys/chimlets and diffuse flow observed. Took one suction sample of white snails and piece of inactive chimney spire.

11 samples total: 4 biology; 4 geology; 1 gas; (2 failed HFS).

S42 Hafa Adai 17N:

Began dive at east rim of **Voodoo Crater** (WP-06) and quickly moved to **Mkr-171** to deploy the Hula temperature array. After deployment, took 8 HFS samples and took HFS sensor readings within the array. Deployed 3 Robosnails inside the array and a MAPR just on the outside of the hoop. Moved down into the crater to the **Snail Graveyard** and took 3

biology, suction samples. Moved up the crater wall just above the graveyard to a diffuse, milky venting site. Collected a rock with barnacles from this site, just inside the southern rim. Drove along the rim of the crater to the west (clockwise) from this site. Observed diffuse venting on the northwest rim. Stopped rim transit after reaching Mkr-171. Moved over to the NE quadrant over the rim and took an altered rock sample outside of the cone. Began transit to Sequoia (WP-02) over sheet flows. Took a sample of the sheet flow west of Voodoo.

23 samples total: 6 HFS (7 failed); 3 biology; 6 geology; 1 gas (failed).

S43 Hafa Adai 17N:

Began dive west of **Breached Cone** and sampled lava from a collapse feature (**WP-10**) in jumbled sheet flow. Climbed the west wall of the cone and then descended into the floor while facing the sheer wall. Traveled out the east side of the cone through the breach just past WP-2 before heading south toward the Hafa Adai chimney field. Drove through lava flows and small craters as approached WP-14. Around **WP-14** found tiny, inactive chimneys and old venting. Took sample of altered chimney in sheet flows near WP-14. Quickly drove south through sheet flows and some hydrothermal deposits to **Alba Vent** (WP-04). Traveled over older chimneys just north of Alba. Small visual survey of Alba before taking 9 HFS, 1 Gas, 1 sulfide and one SPME puck samples ($T_{max}=238.6^{\circ}\text{C}$). Drove west in mid-water to **Sequoia** chimney and landed at its base where **Mkr-254** (the marker that fell from the basket previously) was located. Conducted biological-video survey of the north side of Sequoia from base to top. Second video survey of Sequoia from its west side, base to top. Then did a third survey from the east side. Dive ended after third survey.

14 samples total: 9 HFS (2 failed); 1 biology; 3 geology; 1 gas.

S44 Hafa Adai 17N:

Dive began near **Mami Wata** (WP-09) in area of old sulfides/chimneys in flat flow with some hydrothermal sediment. Collected rock sample in older lavas with some sulfides near Mami Wata (navigation jumps). Moved west slightly into terrace structure with diffuse venting and took HFS sample (13.3°C) and did a video survey of the site. Transited to **WP-07** over old chimneys, sulfide deposits and jumbled flow. At WP-07 surveyed chimney and pagoda-like flanges where the S41 chimney sample was taken. Explored larger chimney to the north which had some mussels. Transit to **Two Towers** (WP-01) over sheet flows. Conducted video survey of the east side of Two Towers from base to top. Surveyed the west side of the chimney from top to bottom. East tower is more active than the west tower at the top. Sampled black smoker near top of east tower, 331°C (3 HFS, 1 Gas and chimlet samples). Transited to **Voodoo** on the north side of Sequoia to avoid collision. Sampled a sulfide on outside wall of Voodoo's west wall (some major navigational jumps on Voodoo approach). At Voodoo, recovery of instruments and sampling at Hula array (MAPR recovery, 9 HFS samples, 2 Robosnail recoveries, 1 Robomussel recovery, Hula array recovery, 2 biology suction samples).

20 samples total: 13 HFS (1 failed); 2 biology; 3 geology; 1 gas.

S45 New Lava:

Began dive from the north at **WP-01** (greatest dE from Sentry MAPR anomaly) in new lava pillows. Collected a piece of lava about 10m west of WP-01. Moved southerly to **WP-02** over new pillows and tubes including a lava flowing over an escarpment (lava waterfall). Some hydrothermal staining but no diffuse flow. Collected lava sample near base of scarp. Continued south toward **WP-03** in continuous new lava with some hydrothermal sediment but no shimmering water. Collected pillow crust going upslope halfway between WP-02 and WP-03. Scaleworms near WP-03 and a sharp drop in ORP sensor. Headed west with temperature and ORP anomalies but no evidence of water flow. Zig-zagged while continuing west to **WP-05**. Near WP-05 and steep flow observed dripping hydrothermal sediments. Collected lava from a claw-like feature. As continued west downslope, passed into old lava. Explored the contact zone between new and old lavas. Collected piece of older lava near **WP-06**. Turned to SE toward **WP-07** through thinner new lava flow with less hydrothermal deposits and eventually all older flows. Collected piece of older pillow crust west of WP-07. Dive ended.

6 samples total: 6 geology.

S47 Perseverance:

Landed on bottom in heavy hydrothermal sediment and an inactive chimney near **WP-01**. Navigation had a large depth offset so drove west to scarp to orient the bathymetry map. Encountered a couple of dead chimneys and large hydrothermal deposits but no flow. At escarpment, explored fissures to NW before turning back east. East run over sedimented pillows and then old chimney with heavy hydrothermal sediments in the flatter area. Drove north to base of large feature and climbed slope before moving back west and off the slope to further determine navigational offsets. Entered region with older chimneys and active, diffuse flow (large ORP signal). Observed many animals (shrimp, crab, snails, scaleworms, sulfide worms). At a chimney (**Leaning Tower**), collected 6 HFS and 2 biology samples (suction and sulfide with animals), T_{max}=45.5°C. Adjacent to this chimney encountered an interesting, active chimney named **Palisades** which looked like a crown. Both located at base of slope. Upslope of Palisades at a heading of 070 a zone of chimneys extruding from the steep basalt slope with diffuse flow. Followed line of chimneys upslope and then downslope when discovered a chimney with snails at the top indicating a hotter flow (**Stump of Mystery**). Took one gas-tight, 5 HFS, 5 bio and 1 sulfide samples, T_{max}=265.7°C. End of dive.

20 samples total: 7 HFS (4 failed); 7 biology (2 with rocks); 1 geology; 1 gas.

S48 Perseverance:

Landed on bottom in sedimented pillow lavas 40m due south of Leaning Tower/Palisades and north of old chimney encountered at beginning of S47. Drove east and found old sulfide rubble surrounded by pillows. Drove further east in pillows and then went north to edge of slope and followed the edge to the west. Went as far as west as **Leaning Tower & Palisades**. Headed upslope NE from these active chimneys. Took a sample of pillow buds as headed upslope. Further upslope ORP signal dropped with a lot of particulates in the water, the temperature rose and there was increased hydrothermal sediment. Patches of sulfides but did not see any diffuse flow. Dive ended prematurely with telemetry problems.

1 geology sample total.

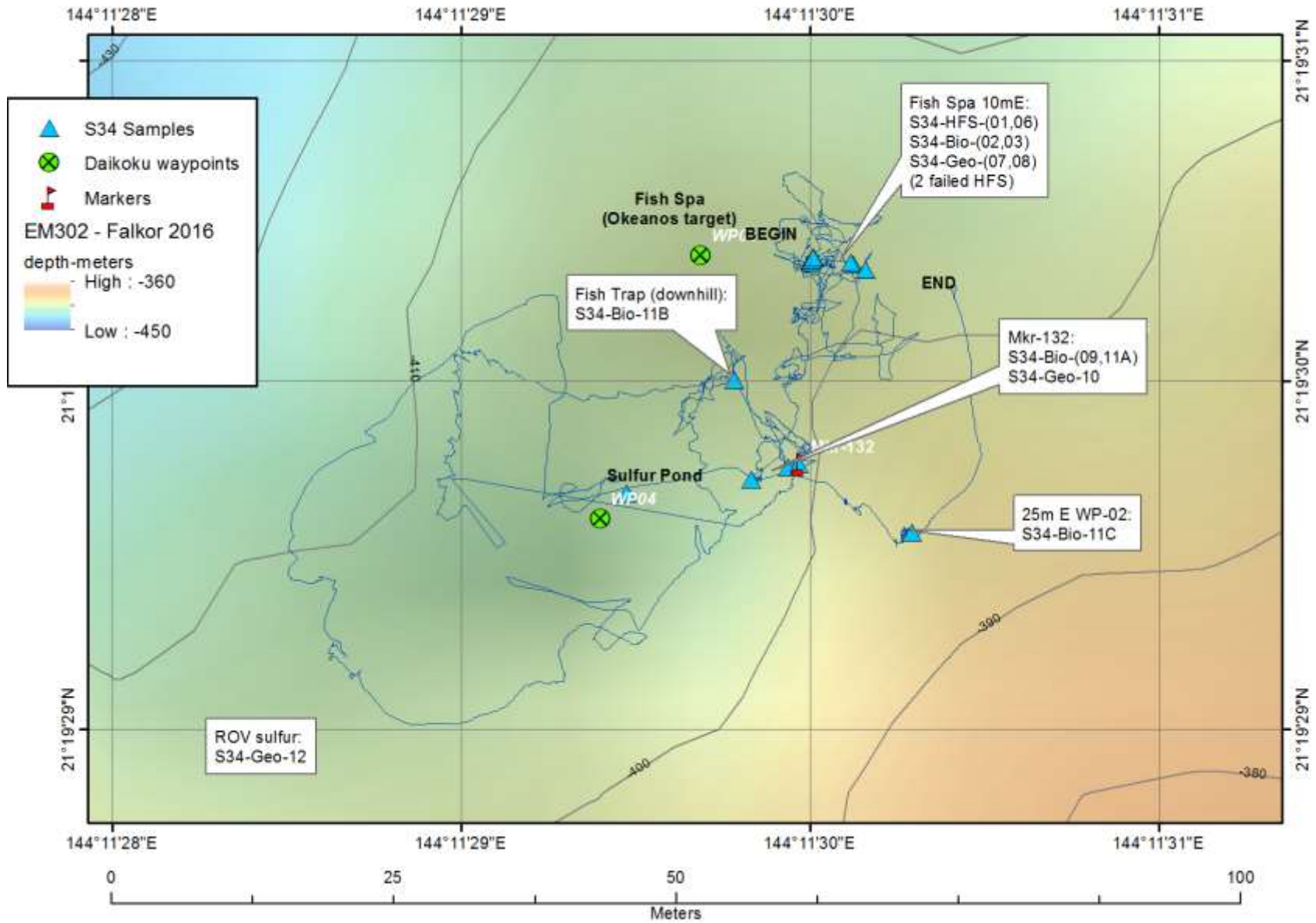
S49 Perseverance:

Dive began on the margin of weather acceptability for the ROV at 8am local time (2200 UTC). At 00:20 UTC with bottom within 150m, weather deteriorated and dive was canceled. Several background water samples were taken on the ascent. At 01:30 UTC, weather improved and decision was made to continue the dive and on the bottom at 02:30 near the **Palisades** site. (Big ORP signal drop on MAPR). From Palisades looking upslope observed pile of old chimneys on bottom. Moved upslope to **Stump of Mystery** and took at GTB. Moved back down toward Palisades/Leaning Tower looking for diffuse water emanating from the basalts. Took suction samples for biology in the flow from the cracks near the base of **Leaning Tower at Limpet Canyon**. Moved slightly after suctioning to take HFS samples from the diffuse flow. After sampling, returned to **Stump of Mystery** for HFS water sampling. Afterward, continued upslope along the ridge then down the slope looking for ORP signals. Could not find signal nor observed anything very active. Returned to Leaning Tower/Palisades area and deployed **Mkr-255 at Palisades**. End of final dive at 06:00 UTC.

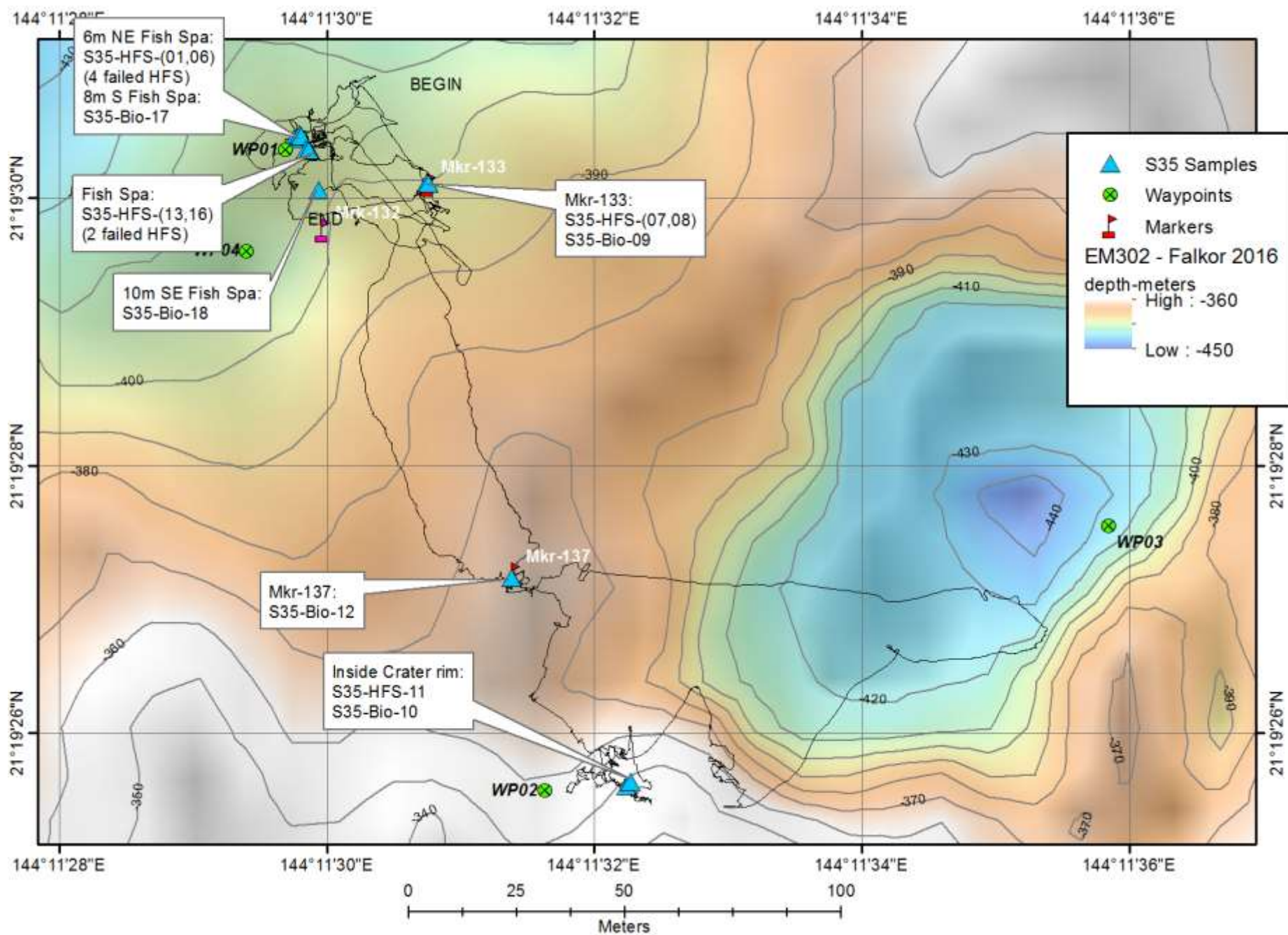
13 samples total: 5 HFS (5 failed); 2 biology; 1 gas.

6.3 Dive Maps

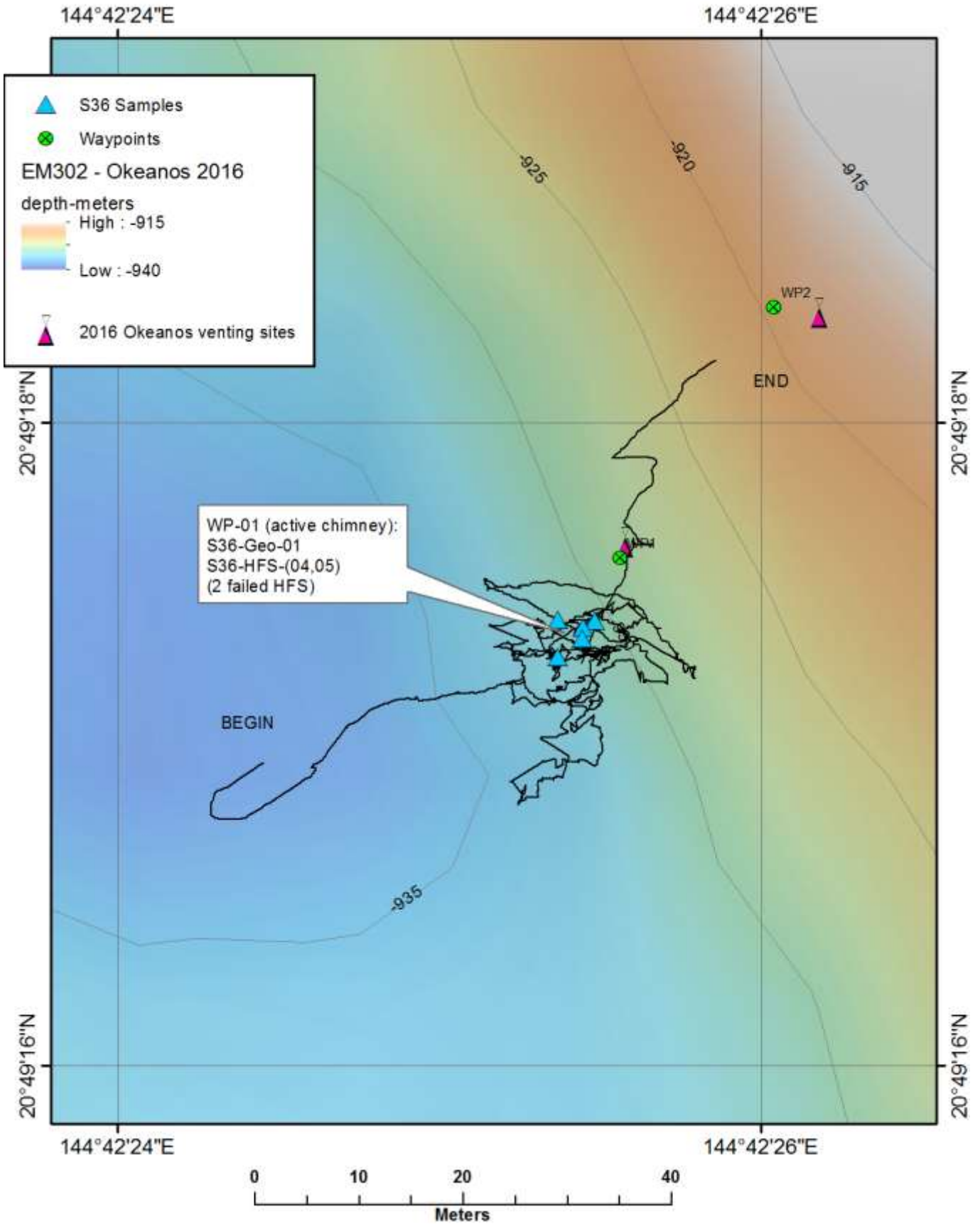
Daikoku - S34



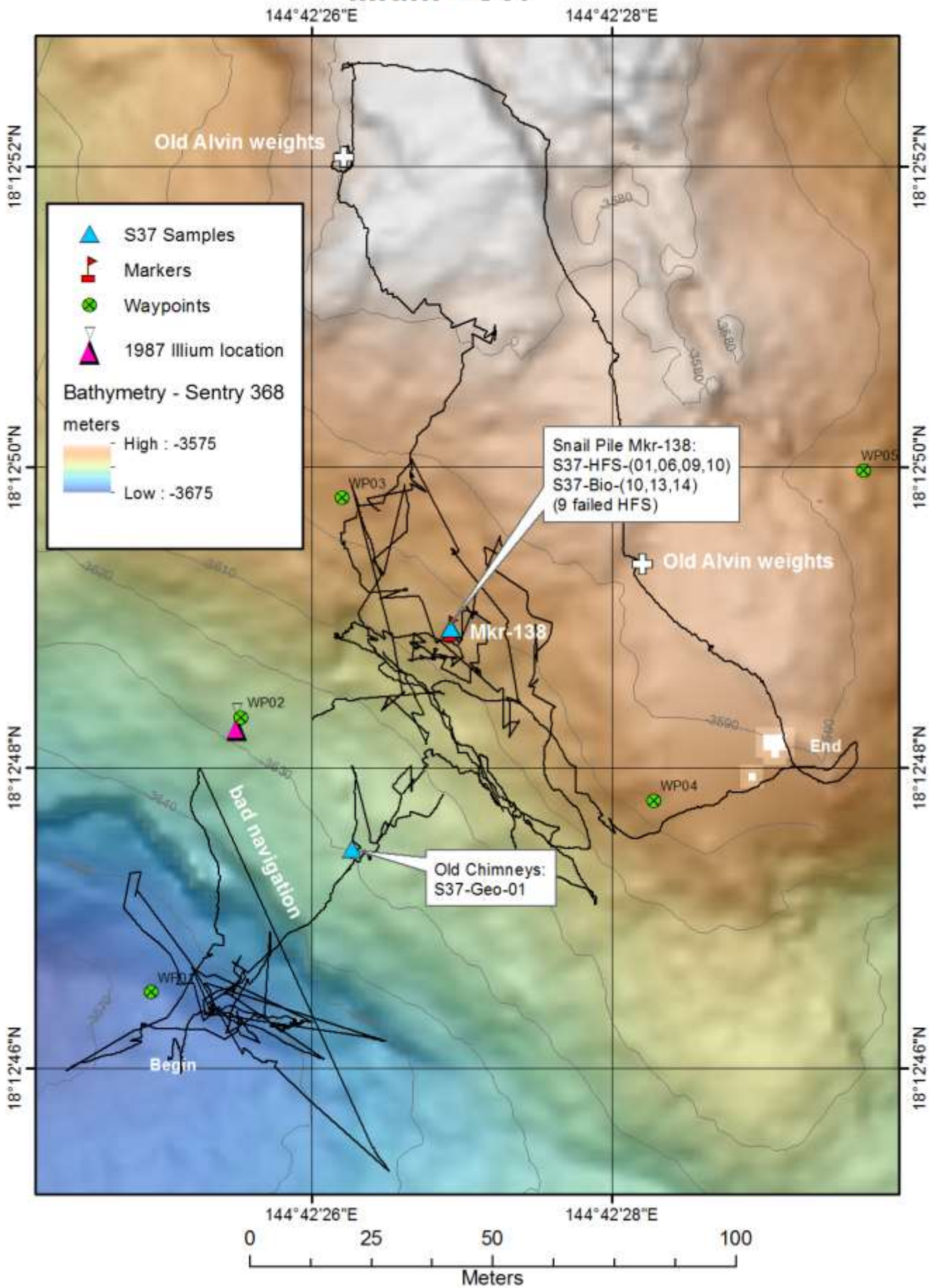
Daikoku - S35



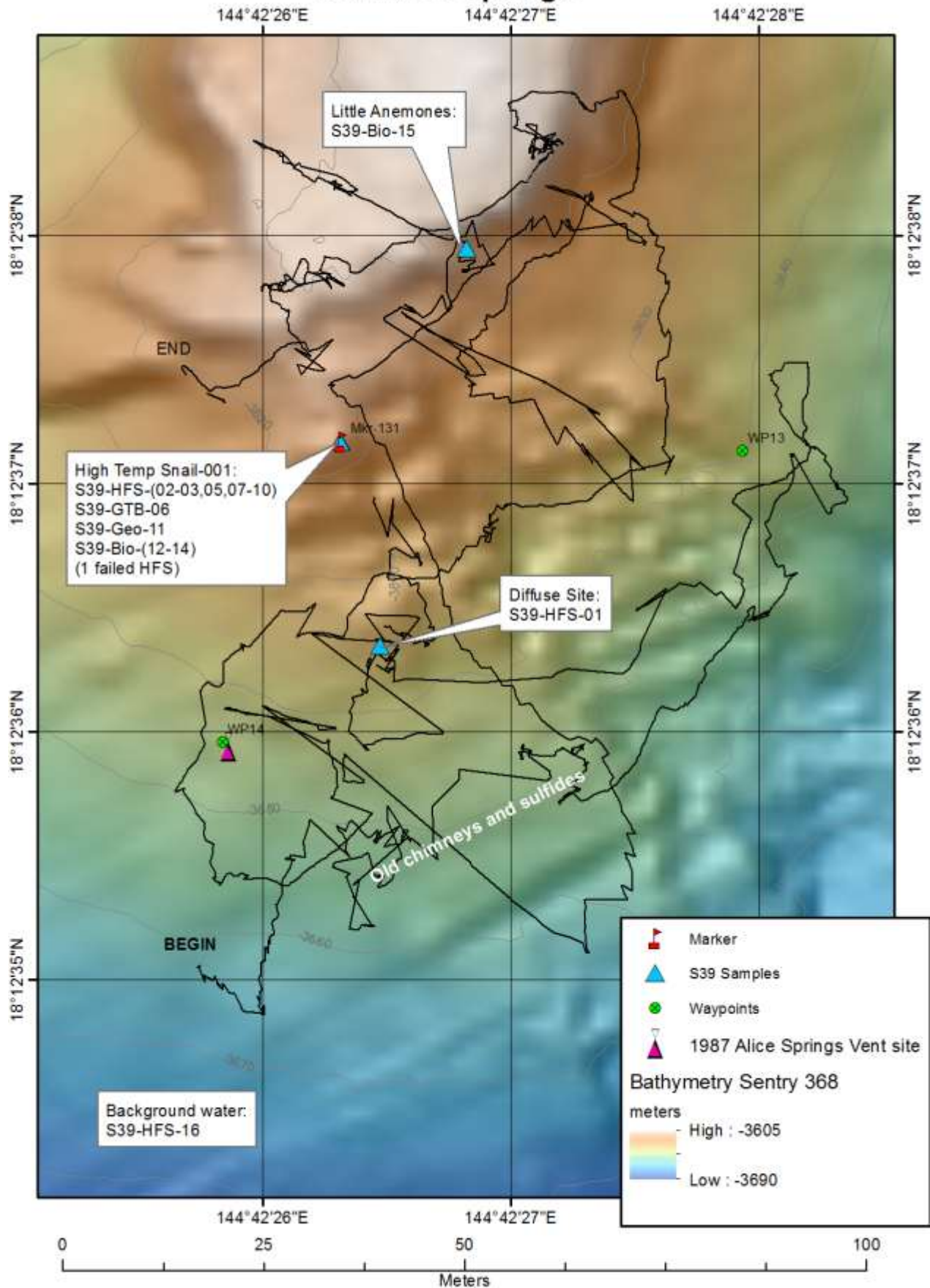
Chamorro S36



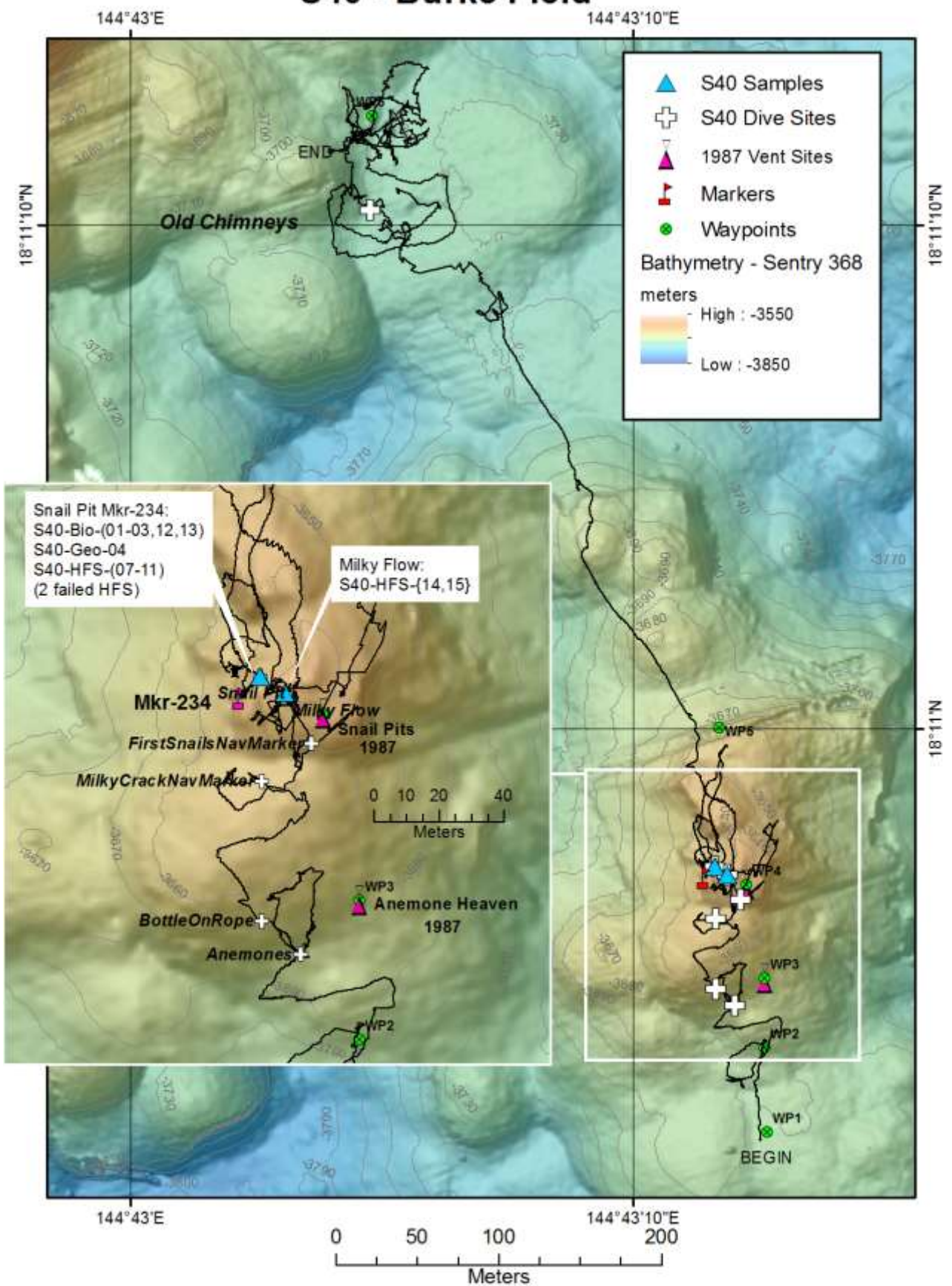
Illium - S37



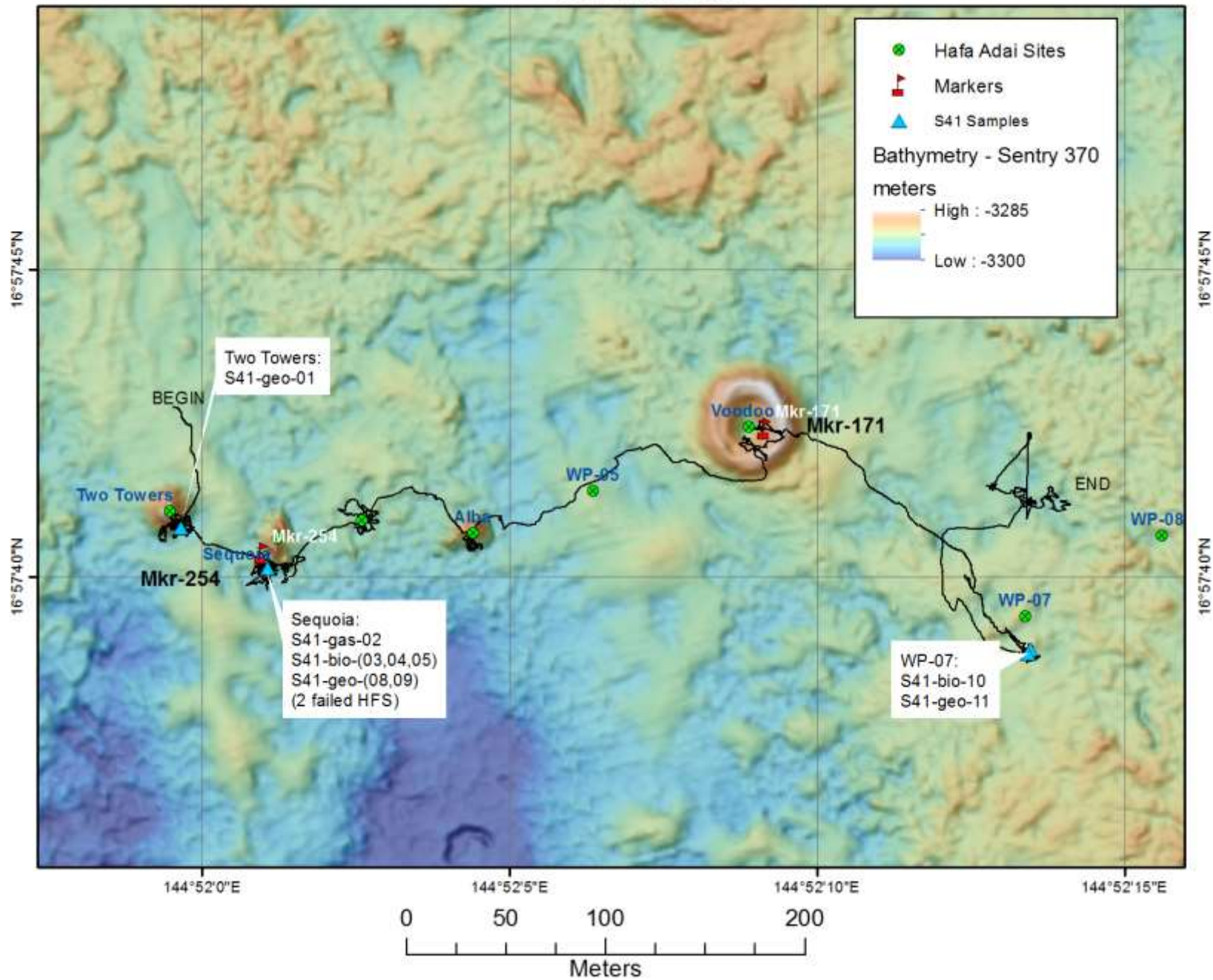
S39 Alice Springs



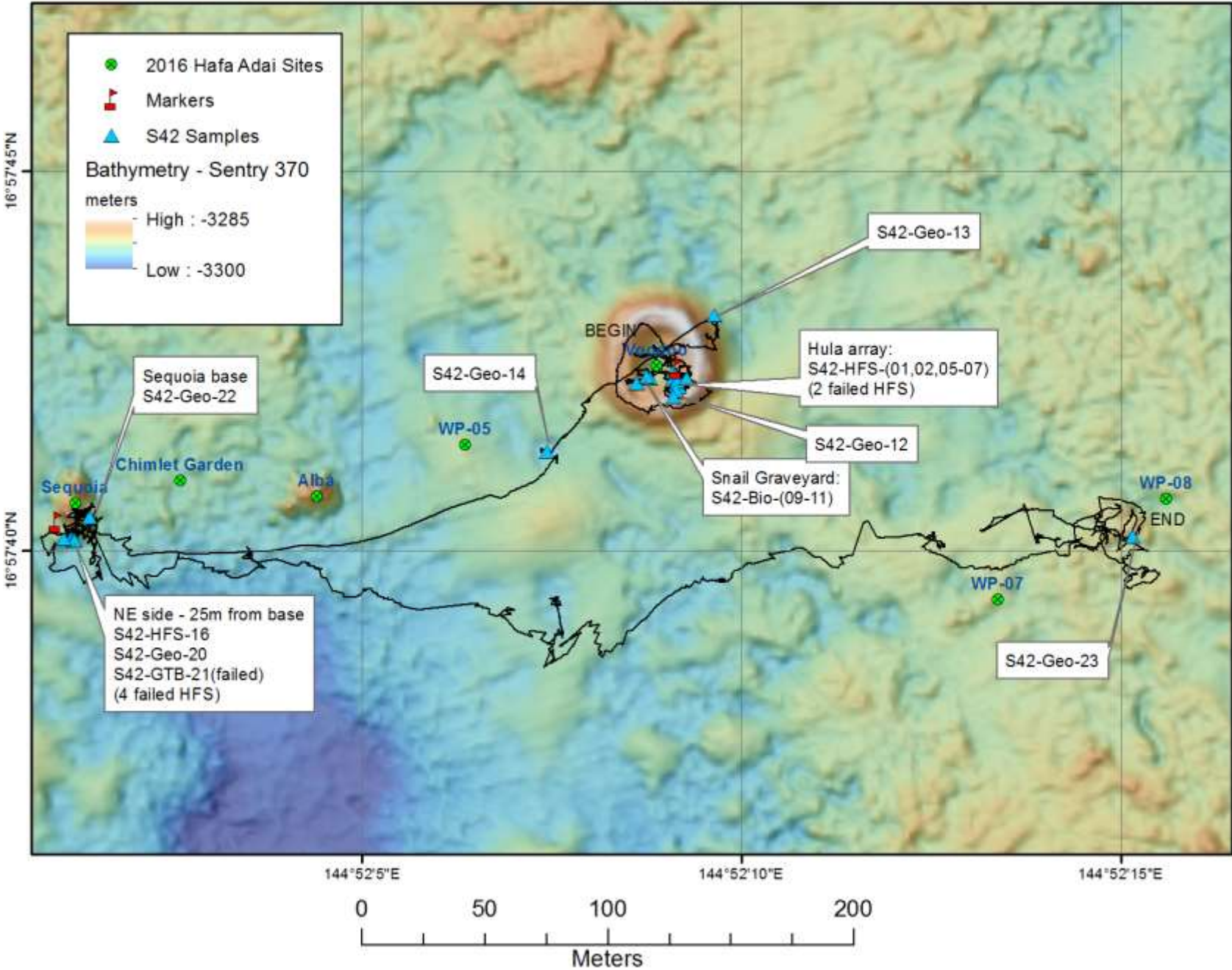
S40 - Burke Field



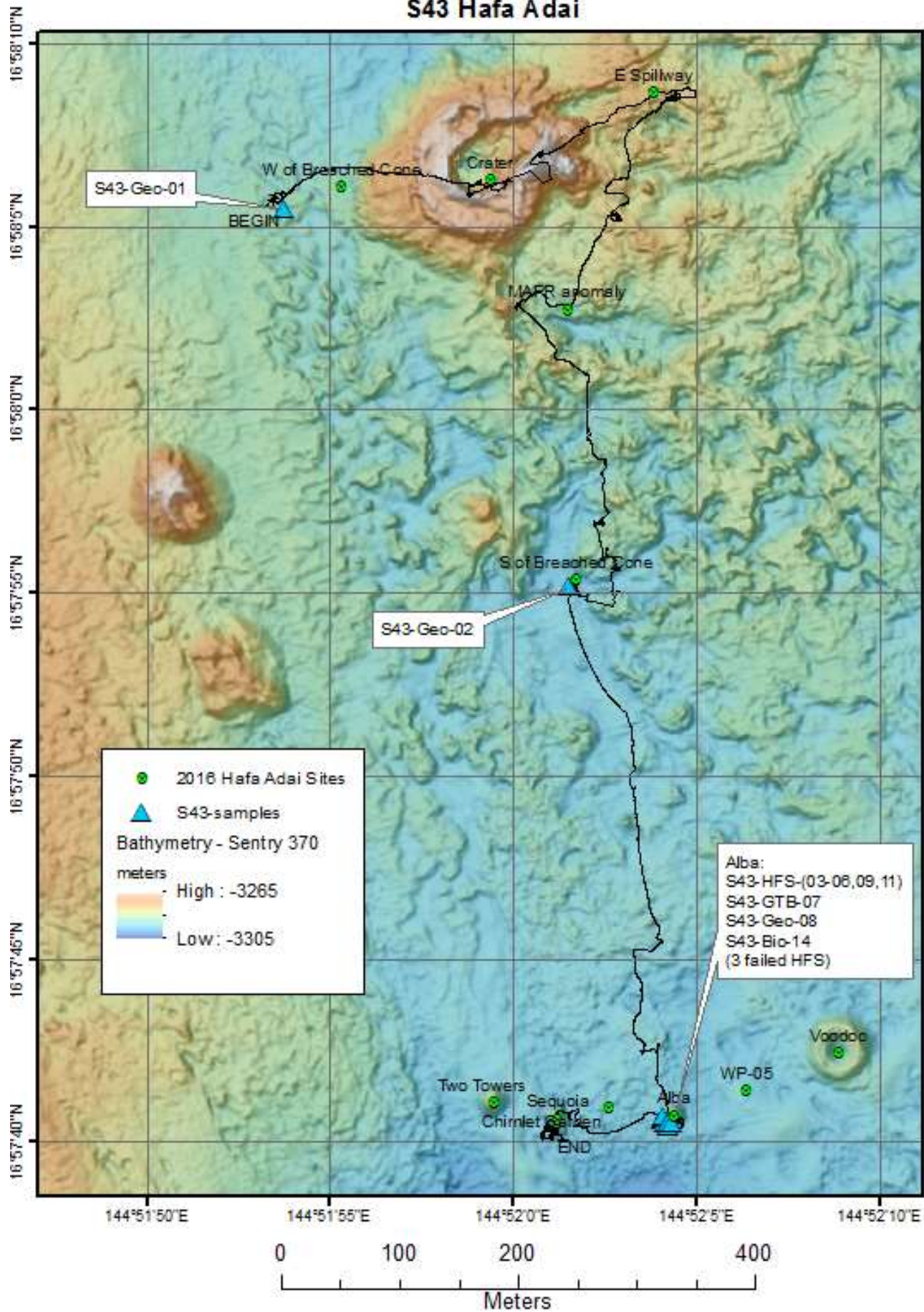
S41 Hafa Adai



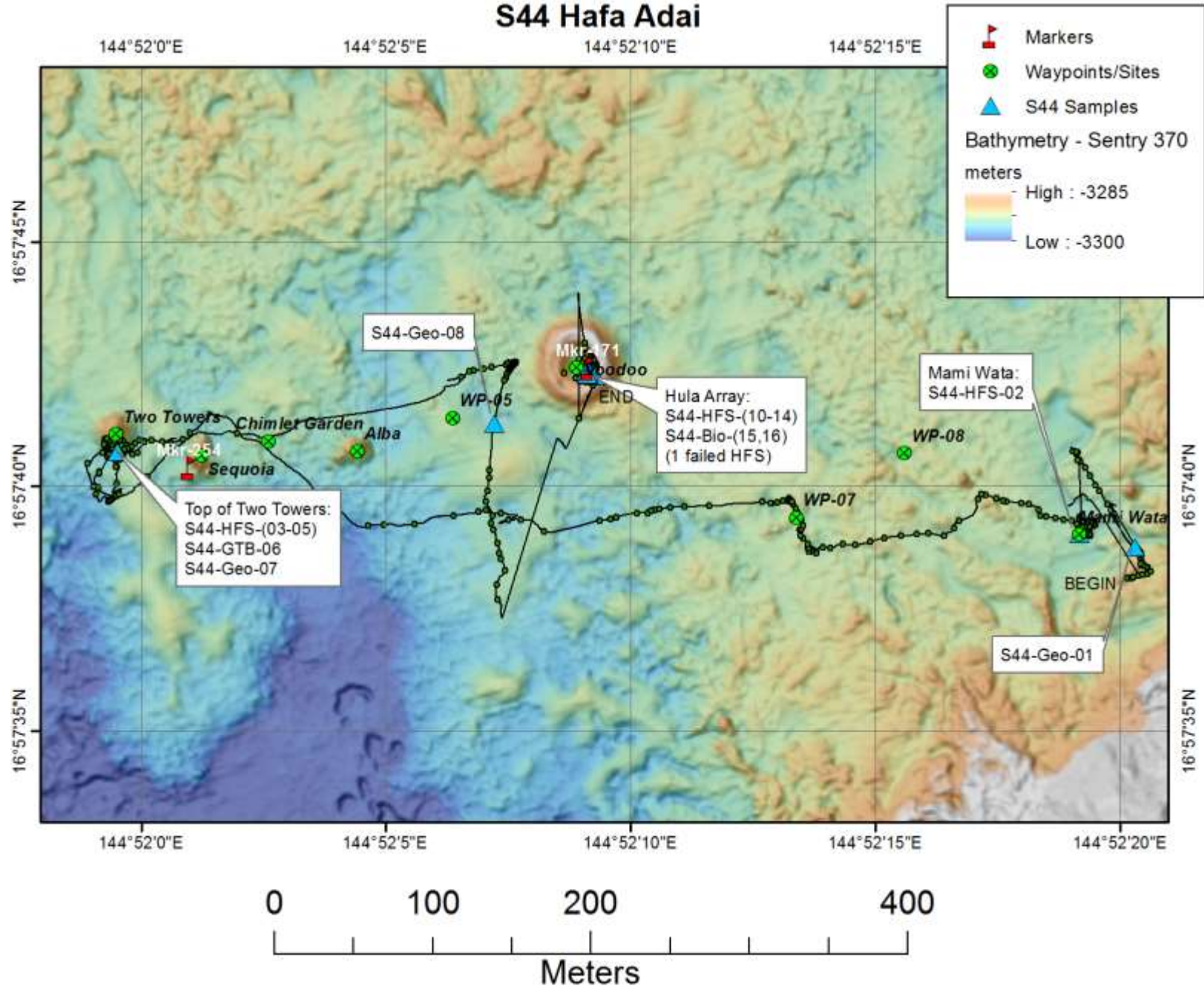
S42 Hafa Adai



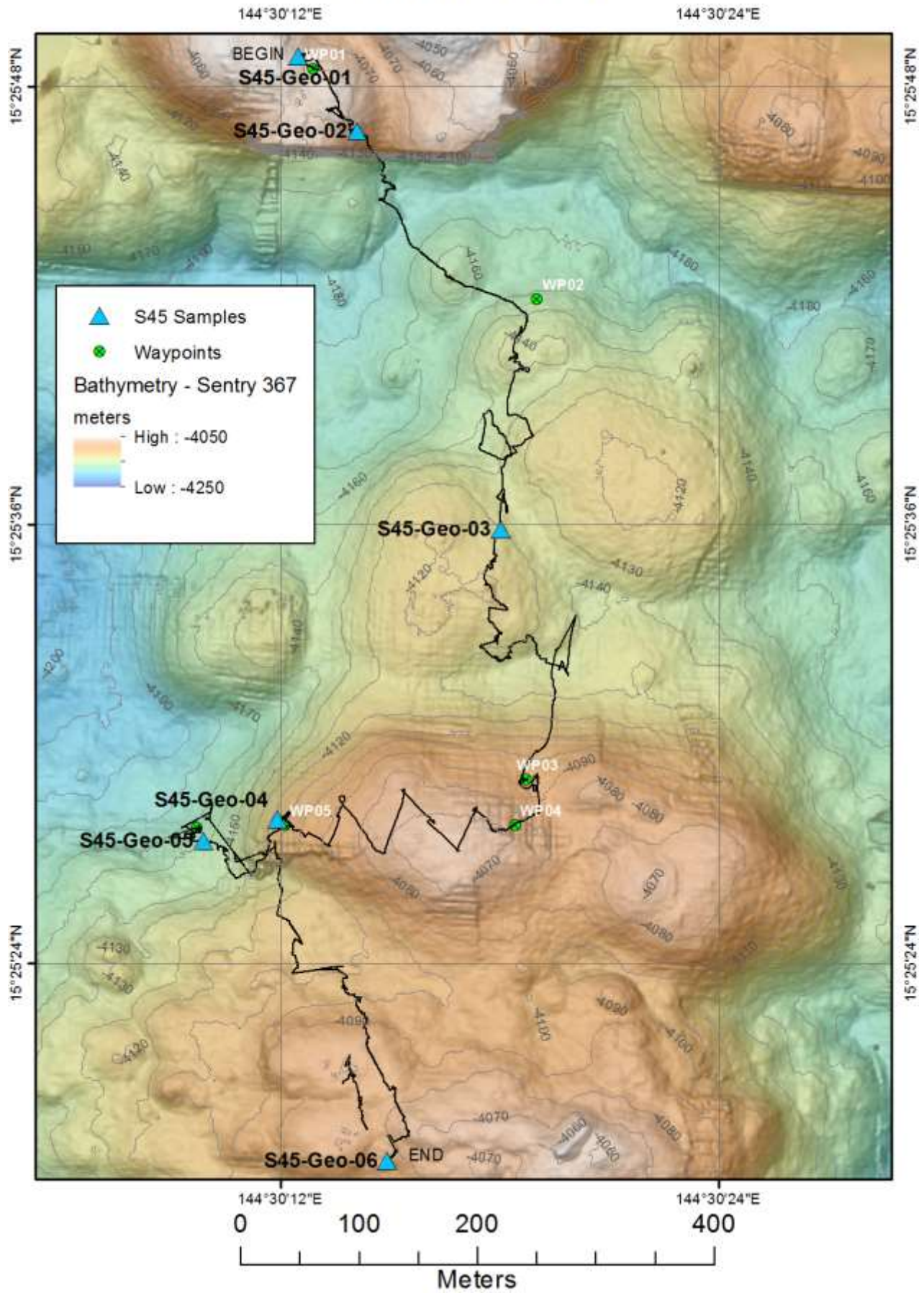
S43 Hafa Adai



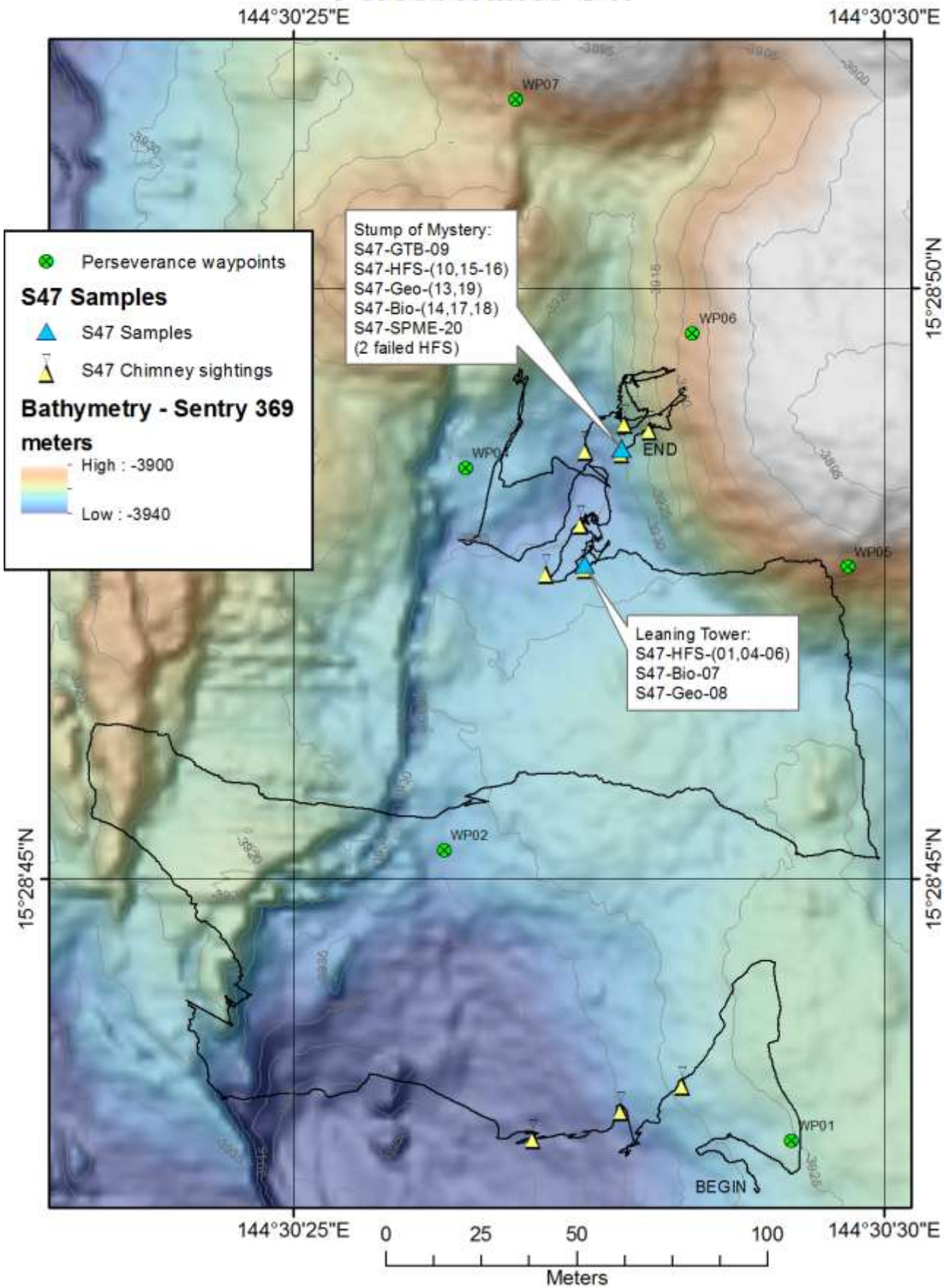
S44 Hafa Adai



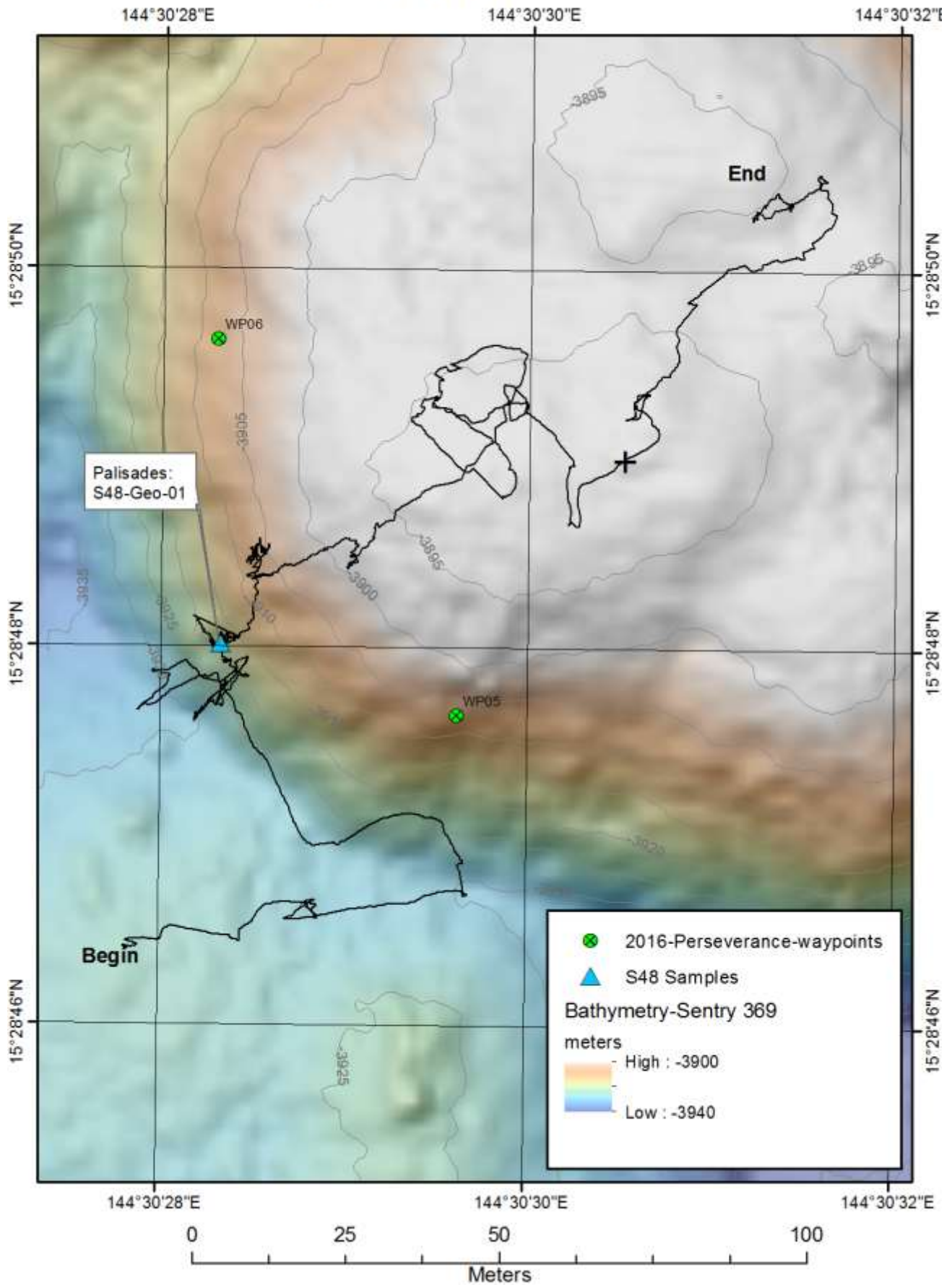
S45 - New Lava Site



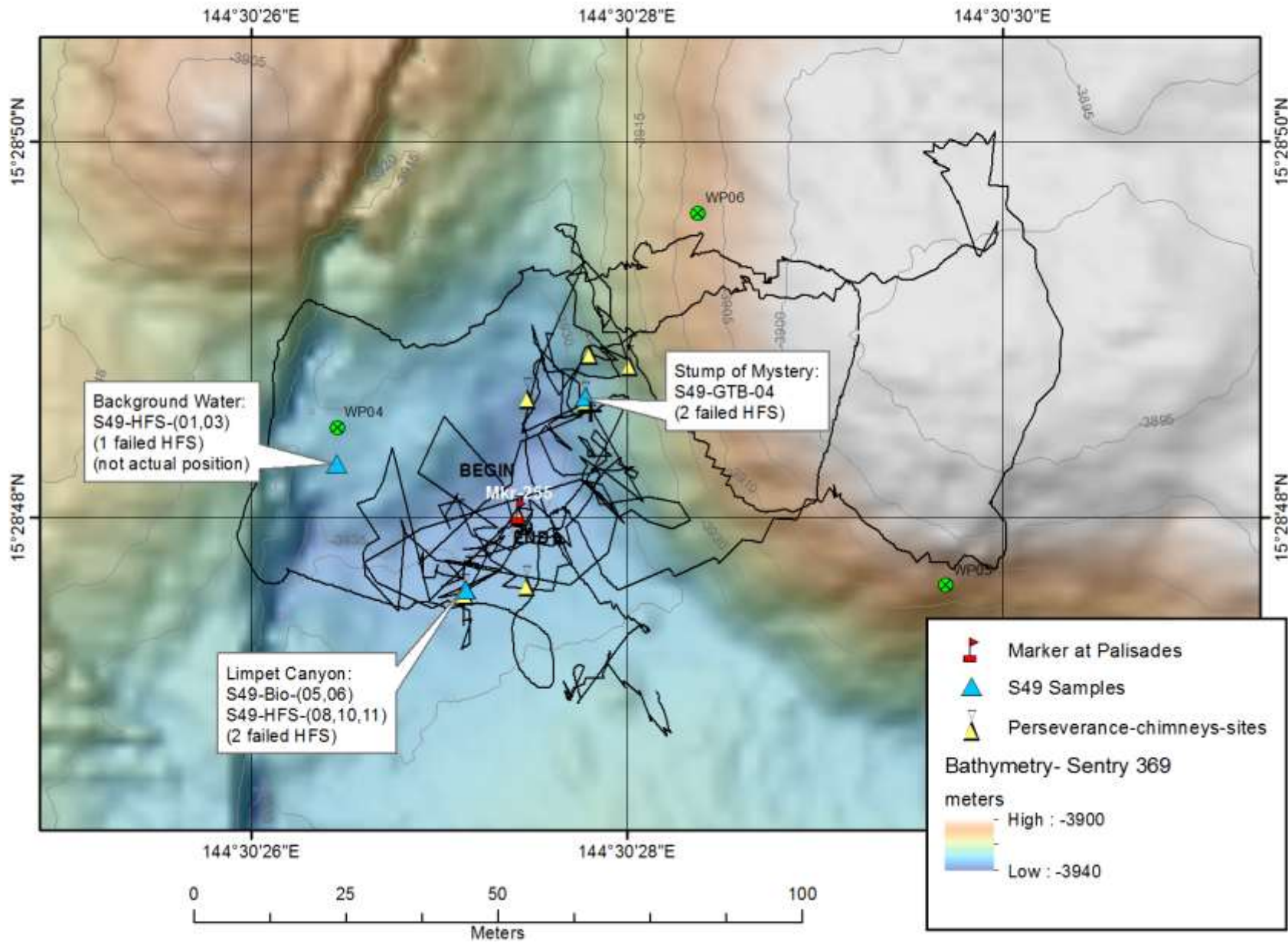
Perseverance S47



Perseverance S48



Perseverance - S49



6.4 ROV Navigation, ROV Depth, and ROV Data

Andra Bobbitt, Sharon Walker, Bill Chadwick

6.4.1 ROV Navigation and depth discrepancies

ROV depth discrepancies are noted in this report but are unresolved at this time. NOAA EOI will discuss these issues further with the SOI ROV team to try to get to the bottom of this apparent problem.

ROV *SuBastian* navigation data was analyzed in comparison to bathymetry collected by AUV *Sentry* in 2015, *Okeanos* 2016 ROV dives and results published from the 1987 Alvin dives for various locations. Table 6.4.1-1 summarizes various navigation (geographic) and bathymetry discrepancies. The *Sentry* bathymetry data had been processed internally (Susan Merle, EOI/CIMRS) to best fit its bathymetric swaths. This process could have created some geographic, X-Y, shifts. Offsets between features discernable between *Sentry* bathymetry and bathymetry collected by ship-mounted systems (primarily EM302) were known prior the expedition but the differences in resolution did not allow for confident shifts to align the data sets prior to ROV *SuBastian* dives. The depth offsets noted in Table 6.4.1-1 between EM302 bathymetry and *SuBastian* depths could also be attributed to geographic offsets. However, the April 2016 *Okeanos* dive at Hafa Adai (EX1605L1-Dive 11) did provide enough information prior to our *SuBastian* dives to align the *Sentry* bathymetry grids to match the *Okeanos* ROV navigation. *SuBastian* dives allowed further refinement in aligning the bathymetry post-cruise. Descriptions of the 1987 site visits at Alice Springs by Alvin were not numerous and dive data (written logs or digitally recorded) were not attainable or do not exist. The published results for these Alvin dives were more descriptive in nature.

We compared depth data from *SuBastian*'s Paroscientific DigiQuartz pressure sensor to the depths calculated from its SBE49 (Seabird) FastCAT CTD. A sample of ROV-Paros-sensor depths compared with depths calculated from CTD pressure (in db) for latitude 15.45° from dive S-45 indicates the ROV-Paros depths are shallower by ~21 m (Table 6.4.1-2). Figure 6.4.1-2 shows the converted CTD depths more consistently match the EM302 bathymetry than the ROV-Paros depth tracks. This is similar to the apparent offset between the ROV-Paros depths and depths recorded by the PMEL MAPR instrument, which was on the vehicle for most dives. ROV-Paros depths are 8-25 m shallower than MAPR depths, and the difference increases with overall water depth. For example, ROV-Paros depths range from 8-20 m shallower than MAPR depths at the 17N site which generally has a bottom depth of ~3290-3295 m (from the bathymetry grids), but at the 15.4N lava flow where bathymetry depth of ~4100 m, the ROV-Paros depth is 18-25 m shallower than the MAPR depth. Since the CTD and MAPR depths agree fairly well, are both more similar to the bathymetric depth data, this suggests that the problem lies with the ROV-Paros depth sensor.

The Paroscientific DigiQuartz pressure sensor should be better than the strain gauge sensors of the SBE49 or the MAPR, so these large differences definitely indicate a problem. The Paroscientific sensor uses calibration coefficients to calculate depth, so one thing to check is to confirm the calibration coefficients are entered correctly with the appropriate number of decimal places. Part of the difference could potentially be due to using an incorrect latitude in the calculation of depth(m) from pressure(db), but the difference between depth(m) calculated from 4000 psi using 0 (the equator) vs 15.5 N is less than 2 m so it is likely more than that.

In addition to these depth discrepancies, not having a functioning altimeter on *SuBastian* adversely impacted reconciling navigation with the bathymetry. The only depths usable for comparison with bathymetry from *SuBastian* were when the ROV was on the absolute bottom while sampling. In all comparisons of depth values between *SuBastian* and other measurements (see table below), *SuBastian* always has significantly shallower readings. The differences are larger than can be accounted by the addition of depth from an altimeter. This difference included depths compared with the 2016 *Okeanos* ROV at the Hafa Adai chimney field.

For many of the dives, ROV navigation while stationary (sampling) had to be disregarded due to the amount of erroneous positions logged. Figure 6.4.1-1 shows the navigation while the ROV was stationary at two different depths. For the Illium site (deep water), navigation wandered significantly from the approach to the bottom and until lift-off after sampling. Positions for sampling sites in these deep-water situations had to be estimated from the first and last good navigation and within the scatter. The shallow dives did not have significant scatter so the originally recorded positions for sampling were retained, even though they aren't exact. No filter or post-processing similar to ROV Jason was provided nor applied to the

data. The erroneous positions were excised from the sample, point and line shapefiles for creating the dive maps of the deeper sites.

Overall, the ROV *SuBastian* navigation system is OK, but not great. The DVL Doppler sonar on the ROV basically did not work most of the time (regardless of the bottom slope, type of bottom, depth, etc, we are working on). USBL was OK, but we had occasional times when it has dropped out for significant time periods. During those times the INS navigation went on crazy "walk-about" which are invalid and distracting to the pilots, the bridge, and the scientists in the Control Room. For example, if we plot the navigation for a given dive in map view, it looks like a rat's nest with huge fliers in all directions, and a poor representation of where the ROV went on the bottom. However, if we edit out all the time periods during which the ROV was stationary on the bottom while sampling, then the ROV track is not so bad. Basically the current software works well if it has all its expected inputs - USBL, DVL, and INS. But if it does not have one or more of these inputs - which is not uncommon - it performs very poorly. If the software were able to take input from the navigator to tell it that the ROV is actually stationary on the bottom, and to ignore any signals from the INS that say otherwise (especially if there are no recent USBL fixes), that would be a huge improvement and could potentially eliminate the bogus fliers.

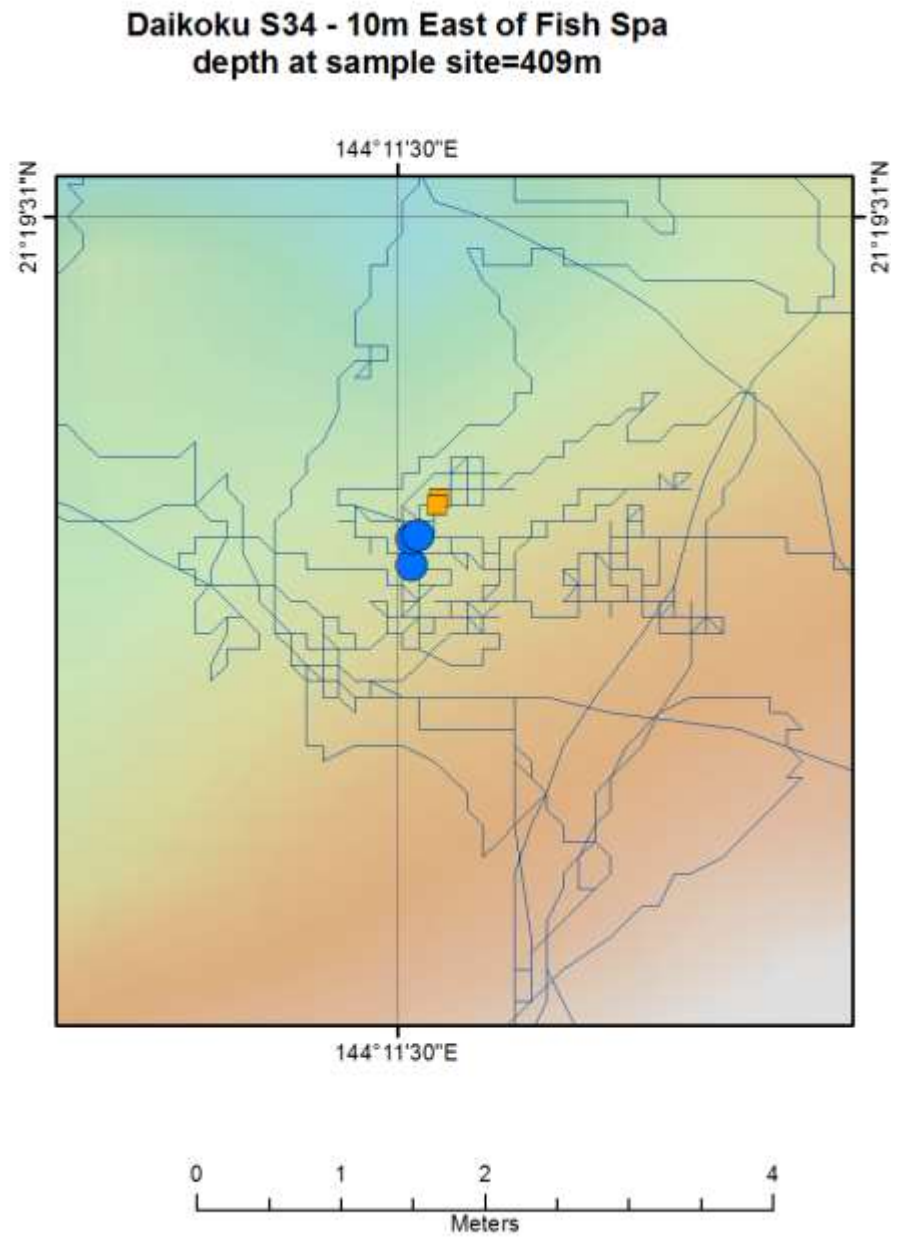
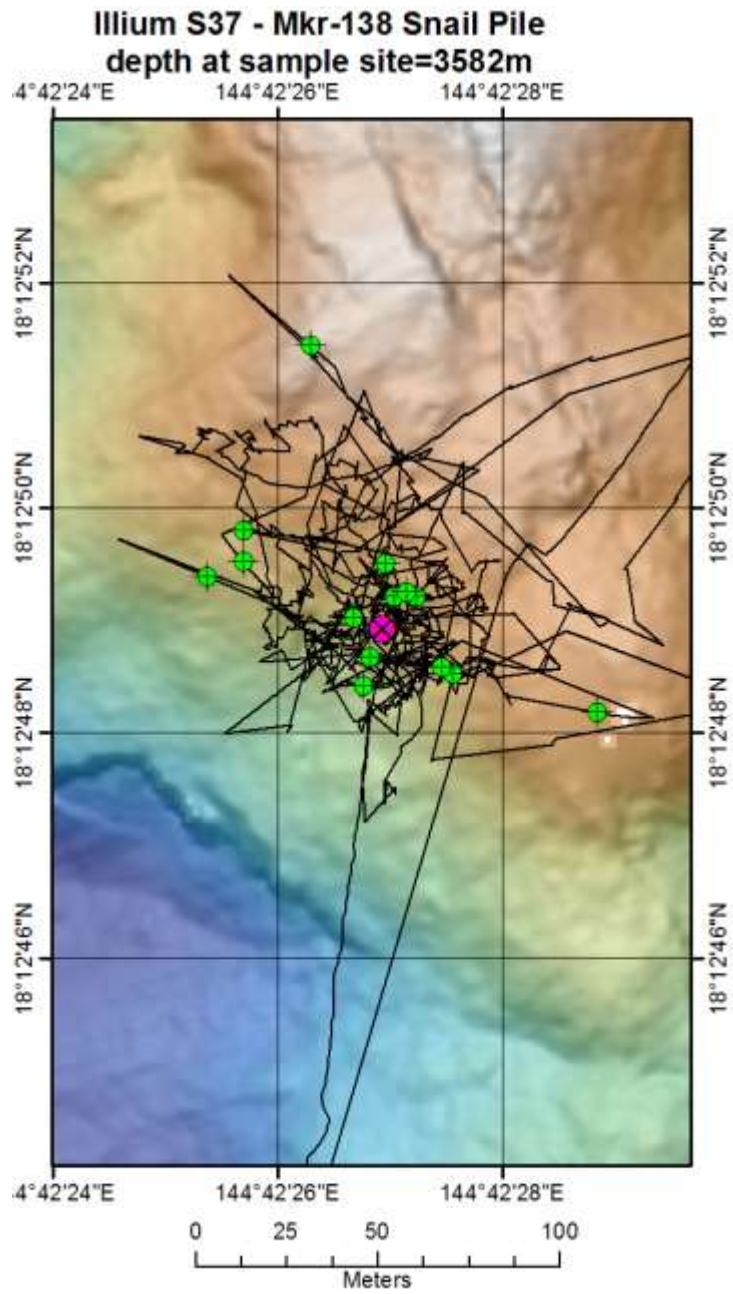


Figure 6.4.1-1 Examples of ROV *SuBastian* Navigation while stationary.

Table 6.4.1-1 Summary of *SuBastian* navigation offsets

Dive	Site	Depth readings in meters				Notes	Depth differences (meters)			Sentry Dive Grid	Shifts-meters (dec. degrees)
		ROV <i>SuBastian</i>	<i>Sentry</i>	EM302	<i>Okeanos</i> ROV		Sub- <i>Sentry</i>	Sub-EM302	Sub- <i>Okeanos</i>		
S34-S35 Daikoku	Fish Spa	408			410	May not be precise same location.					
	Tubeworms	356			355						
S36- Chamorro	chimney site (WP-01)	920			930	Not exact same location and on a slope.					
S37-Illium	Snail Pile	3582	3603	3611		1987: <i>Alvin</i> depth 3595	-21	-29		368	(no shifts)
	Old Chimney	3610	3630	3654			-20	-44			
	top of ridge	3563	3572- shallowest in grid	3584- shallowest in grid		1987: 3595 Illium vent on ridge crest	-14	-26			
	along ridge top	3559									
Dead chimneys/ <i>Alvin</i> weight (Illium?)	3558										
S39-Alice Springs	Old chimneys-Sulfides	3629-3639	3648- shallowest at crest			1987 high temp site: <i>Alvin</i> depth 3640 on crest of axial ridge; small patch of dead chimneys				368	(no shifts)
	Diffuse sample site	3625	3633	3662			-8	-37			(no shifts)
	Mkr-131 Snail001 (high temp)	3611	3630- (crest of ridge is 3617)	3644			-19	-33			(no shifts)

Dive	Site	Depth readings in meters				Notes	Depth differences (meters)			Sentry Dive Grid	Shifts-meters (dec. degrees)
		ROV <i>SuBastian</i>	Sentry	EM302	<i>Okeanos</i> ROV		Sub-Sentry	Sub-EM302	Sub- <i>Okeanos</i>		
S40-Burke	Snail Pit	3630.5	3643	3679		1987: <i>Alvin</i> Snail Pit 3660	-12.5	-48.5		368	(no shifts)
S41-S44 Hafa Adai	Voodoo Rim (S42)	3276	3286		3290	Altimeter not working but depths not too far offset between Sentry 370 & <i>SuBastian</i> .	-10		-14	370	shifted: -16S / +4Y (<i>Okeanos</i> nav shifted 42X / 10Y)
	Snail Graveyard	3284	3293		3294		-9		-10		
	Sequoia Top	3255	3284		3267		-29		-12		
S45-New Lava	Top of mini-cone	4132	4151			Bathy shifts based on waterfall and transit of a small mound.	-19			367	shifted: 60X / 20 Y (.00547/.000181)
S47-S49 Perseverance	Cone to scarp; along scarp	3920	3932			Bathy shifts from S49 transit from base of mound across to scarp and then south along scarp.	-12			369	shifted: -70X / -10 Y
	S48 edge of mound	3912	3929				-17				
	S47 edge of mound	3914	3929				-15				

		15.5N	
ROV-Paro(m)	ROV-CTD(db)	ROV-CTD(m)	difference (CTD-Paro)
3895.86	3976.363	3916.328	20.5
3895.58			
3889.39			
3889.46	3969.849	3909.970	20.5
3890.03	3970.529	3910.633	20.6
3898.53	3979.448	3919.339	20.8
3889.98	3970.878	3910.974	21.0
3888.02	3968.791	3908.937	20.9
3885.38	3966.093	3906.304	20.9
3882.22	3962.765	3903.055	20.8
3876.96	3957.131	3897.556	20.6
3879.04	3959.409	3899.779	20.7
3881.91	3962.259	3902.561	20.7
3885.57	3966.048	3906.260	20.7
3889.63	3970.362	3910.470	20.8
3888.48	3969.102	3909.241	20.8
3887.69	3968.272	3908.430	20.7
3889.41	3969.796	3909.918	20.5

Table 6.4.1-2 Sample of depth values recorded on S-45 with the Paroscientific gauge and the converted CTD depths.

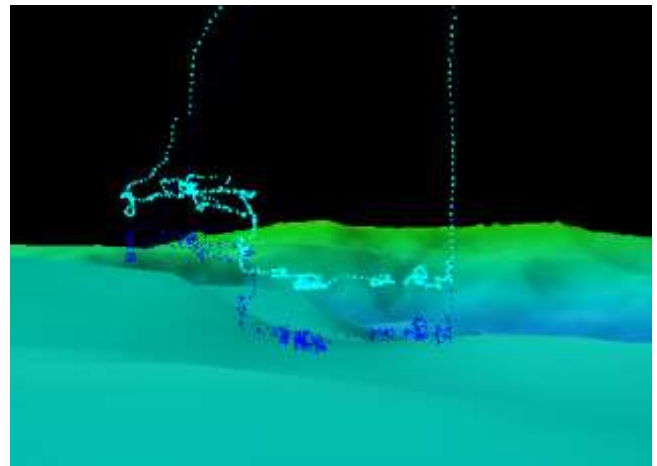


Figure 6.4.1-2 Dive S-48 ROV navigation comparison of converted CTD pressure to depth (dark blue) and pressure gauge (light blue).

The following are notes on the navigation and data for each dive.

S34-S35 Daikoku

Shallow dive with great navigation on both dives. Navigation did not wander much (only 3-4m) while sampling. *SuBastian* navigation had a slight offset with the 2016 *Okeanos* navigation (which was much noisier than *SuBastian*) at the tubeworm site (WP-02). *Okeanos* ROV was 20m west of *SuBastian* but the Fish Spa (WP-01) and Sulfur pond (WP-04) locations corresponded. No depth offset between *SuBastian* sampling depth and *Falkor* 2016 EM302 bathymetry. (See Figure 6.4-1) (Higher-resolution bathymetry SM2K data is no longer usable at this site due to more recent volcanology resulting in altered topography.)

S36 Chamorro

Extremely short dive due to deteriorating weather. Dive not long enough to analyze navigation.

S37 Illium

Problems with navigation at the beginning of the dive with significant jumps in position while switching between INS and USBL. While sampling at these deeper depths (~3600m) and ROV not moving, navigation had extremely erratic positions. Significant offsets in depth between 1987 dive location, Sentry 368 bathymetry and *SuBastian* depths. In all cases, *SuBastian* depths are significantly shallower than previous data from *Sentry*/EM302/*Alvin*. (See Figure 6.4-1)

Depth differences (meters):

Sampling:

Snail Pile Site: *SuBastian*=3582, *Sentry*=3603, EM302=3611

Old Chimney Site: *SuBastian*= 3610, *Sentry*=3630, vs EM302=3654

1987 Illium Site Description: *Alvin* depth=3595; Temperature 250-290°C. (1987: Crest of ridge, several active chimneys. Low mound (20-30m diameter) with cracks of 50°C water & hairy snails).

S39 Alice Springs:

Bathy/Nav discrepancies:

1987 Alice Springs site description for high-temp site: Depth=3640; Temperature 250-290°C along a ~200m of northern axial ridge near its midpoint @18°12'N; in small patch of dead chimneys. *SuBastian* encountered dead chimneys and sulfides at the beginning of the dive (no venting observed) and depths were 3629-3639. During this period there were a few altimeter readings which would then match the 1987 depths.

SuBastian depth at Little Anemone site was 3598m and Sentry 368 bathy grid max depth is 3606, there are no places shallower. Would have to move the bathy grid ~20m south to have this sampling site at the 3606m depth. All the sampling sites' depths are offset from the *Sentry* bathy (shallower than map) indicating the bathy grid should shift south.

Navigational errors: Encountered Mkr-131 three times (deployment and twice transiting). Transit locations agree fairly well since not precisely at marker while transiting, it is in view.

S40 Burke:

In the vicinity of the 1987 Anemone Heaven site (~20m SW), concentrated areas of Anemones were observed by *SuBastian*. The depth range of *SuBastian* was 3648-3654, not too offset from the 1987 3660 reported depth. This where the bottle on a rope was also observed and could have been deliberately placed on the seafloor, 3639 meters depth.

1987 *Alvin* described the Snail Pit site as an open fissure at 3660m. *SuBastian* encountered a milky crack running N-S SW of the reported 1987 position but encountered no distinct fissures. (Sentry 368 bathymetry did not reveal any distinct fissure in the area.) Moving upslope along the crack, *SuBastian* encountered snails at the First Snails Navigational Marker

and the Snail Pit sampling site. *SuBastian's* depth along the crack ranged from 3628-3624 (*SuBastian* depths: First Snails 3628; Snail Pit 3630).

S41-S44 Hafa Adai 17N:

Drove the rim of Voodoo on S42 and used this to do the final alignment of the Sentry 370 bathymetry to the *SuBastian* navigation. Shifted the bathymetry 16m south and 4m east for the best match at Voodoo. *Okeanos* navigation was then shifted to best match *SuBastian* and the shifted bathymetry. Navigation is still offset at Two Towers from the bathymetry after this shift (needs to move a further 10m south and 4m east). S43 navigation at the Breached Cone (furthest positions from Voodoo) are still offset about 15m to the east and may have an offset in the Y direction as well but without an altimeter during transiting this could not be ascertained. Prior the *Falkor* dives, the *Okeanos* navigation and comments indicated a navigational offset and the data was shifted to coincide prior the *SuBastian* dives. This further revealed that *Okeanos* had not visited the first waypoint as believed, that dive actually began at Sequoia and not Two Towers.

Depths from *SuBastian* are also offset from both the Sentry 370 bathymetry and the *Okeanos* ROV. *SuBastian* is 10-14m shallower than the *Okeanos* ROV at the same locations (in Voodoo and the top of Sequoia). *SuBastian* is also shallower than the Sentry 370 bathymetry, by 10-15m.

Okeanos ROV shifted nav : 42x and 10y to match *SuBastian*.

Sentry 370 shifted grids: -16x and +4y to

S45 New Lava Site:

Scarp at beginning of dive (lava waterfall) and reference to small mound indicated navigation and bathymetry did not align. Shifted Sentry 367 20mN and 60mE to better match. Altimetry data would have been extremely useful in this site to rectify the differences since *SuBastian* transited up and down over distinct features. Shifted bathymetry in decimal degrees: .000547x/.000181y Z factor for hillshade/slope: .00000932

Bad navigation at end of dive (in the old-new lava contact area) with big jumps while sampling.

S47-S49 Perseverance: (Bathy shift now at 10w/70s)

S47 was confusing at the beginning of the dive as features and depths were not coinciding with the Sentry 369 data. The original dive plan was diverted to the west to cross a significant scarp in the hopes of orienting *SuBastian* to the bathymetry. The bathymetry data was shifted after S47 to better navigate the subsequent dives, however, there was a more significant N-S offset than originally determined after the expedition.

S48 navigation was offset 20m east compared to S47 but poor telemetry ended the dive early and could have been the issue.

Bottom time was also used spent on this dive to further determine the navigation offset from the Sentry bathymetry by traversing west from the edge of the cone to the scarp and then continuing south along the scarp. This produced the post-cruise 10w/70s bathymetry shift which reconciled all 3 dives to the bathymetry. Much of this dive was devoted to sampling which produced erratic navigational fixes with the ROV on the bottom. S49 1-second navigation positions do not match IRLS comments positions at the beginning of the dive. After the first sampling run, positions seem to match. (Very bad weather?)

6.4.2 Markers and Sites

Markers:

Markers were deployed in nine locations during operations. (Table 6.4-2 and Figure 6.4-2) The majority of markers were deployed to denote sampling locations and/or instrument deployment sites. One marker (Mkr-254) was deployed accidentally (S41) when it fell while working with instruments in the basket and the vehicle at 13m above the seafloor at Sequoia chimney. This marker was later located at the base of Sequoia on a subsequent dive (S43). The final deployment of Mkr-255 was at Palisades, an active chimney, that was adjacent to the sampled Stump of Mystery. Significant sites and chimney locations are listed in Table 6.4-3 for the expedition. Positions were determined from *SuBastian* navigation.

Table 6.4.2-1 Markers deployed by *SuBastian*

Deployment dive (Time UTC)										
Marker	Dive	Date	time	Latitude	Longitude	Z	Gyro	Location	Observation	Best_Image
Mkr-132	S34-Daikoku	12-02	07:22	21.32493	144.19166	403	214	Fish Spa	Marker is ~20m 2SE of WP-01 at <i>Okeanos</i> Fish Spa next to first fish trap deployment. Near edge of sulfur crust rim.	S5K17341.jpg
Mkr-133	S35-Daikoku	12-03	01:49	21.32503	144.19188	407	143	Fish Trap Site 1	Marker is ~30m SE of Fish Spa (WP-01).	S5K15907.jpg
Mkr-137	S35-Daikoku	12-03	02:15	21.32422	144.19205	371	84	Fish Trap Site 2	~50m N of WP-02 at fish trap deployment site. No fish collected. One sediment scoop from site.	S5K24717.jpg
Mkr-138	S37-Illium	12-05	04:22	18.21359	144.70748	3582	323	Snail Pile	Marker is just to the left of where the snail and water sampling occurred while facing 322deg.	2016-12-05T04_23_54.336244_S5K.jpg
Mkr-131	S39-AliceSprings	12-06	08:03	18.21033	144.70731	3611	229	Snail 001	At the Robosnail deployment site.	2016-12-06T08_05_06.338523_S5K.jpg
Mkr-234	S40-Burke	12-07	04:12	18.18251	144.71984	3631	360	Snail Pit	At snail pit site where Robosnail deployed.	2016-12-07T04_15_05.967132_S5K.jpg

Deployment dive (Time UTC)

Marker	Dive	Date	time	Latitude	Longitude	Z	Gyro	Location	Observation	Best Image
Mkr-254	S41-HafaAdai	12-08	03:55	16.96122	144.86693	3282	123	Sequoia	Base of Sequoia: Dropped the marker down to the base of the chimney which is 13m below. Position is from S43 (06:42) when marker was viewed on the bottom.	(S43) 2016-12-10T06_43_06.686161_S5K.jpg
Mkr-171	S41-HafaAdai	12-08	06:40	16.96178	144.86920	3277	92	Voodoo	Marker is near the east crater rim on the inside but further down from the rim in a flatter area with snails. Site of the HulaHoop experiment.	2016-12-09T03_06_16.901719_S5K.jpg
Mkr-255	S49-Perseverance	12-18	05:57	15.48001	144.50762	3914	22	Palisades	Palisades is located near the Stump of Mystery (which is further upslope).	2016-12-18T05_58_34.673793_S5K.jpg

Images of markers deployed:

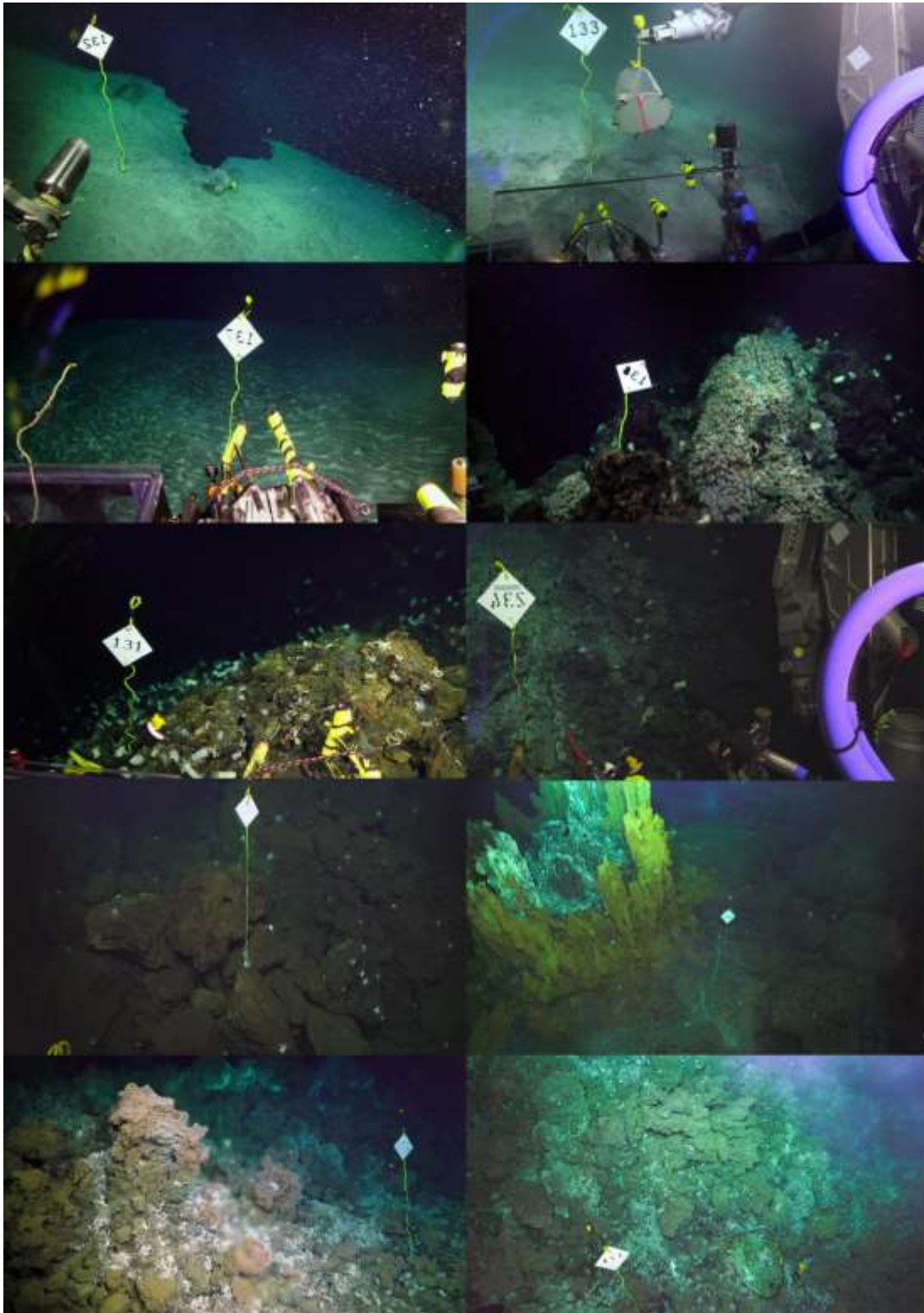


Figure 6.4.2-1 Markers deployed by SuBastian: By row (top to bottom) and left to right: Mkr-132 (Daikoku Fish Spa); Mkr-133 (Daikoku Fish Trap Site 1); Mkr-137 (Daikoku Fish Trap Site 2); Mkr-138 (Illium Snail Pile); Mkr-131 (Alice Springs Snail-001); Mkr-234 (Burke Snail Pit); Mkr-254 (Sequoia); Mkr-255 (Perseverance Palisades); both images, Mkr -171 (Hafa Adai Voodoo)

Table 6.4.2-2 Vents and significant sites visited by *SuBastian*

Name	Vent or Site	Latitude	Longitude	Depth	Description	Sampling
Daikoku-WP01	diffuse	21.32510	144.19158	410	Fish Spa	sampled
Daikoku-WP02	diffuse	21.32377	144.19212	360	Tubeworms inside S crater wall	sampled
Daikoku-WP03	vent	21.32432	144.19329	375	White smoker vent inside East crater wall	not sampled
Daikoku-WP04	diffuse	21.32489	144.19150	417	Near molten sulfur pond	sampled
Daikoku Mkr-137	diffuse	21.32422	144.19205	371	Fish Trap Site 2	sampled
Chamarro-WP1	vent	20.82149	144.70707	928	vent-7m SW of original waypoint	sampled
Old Chimneys (Ilium)	dead	18.21318	144.70730	3610	Old sulfide Chimneys	sampled
Snail Pile Mkr-138 (Ilium)	diffuse	18.21359	144.70748	3582	Diffuse flow with lots of biology	sampled
Old Alvin weights (Ilium)	site	18.21371	144.70784		Old Alvin weights	not sampled
Old Alvin weights (Ilium)	site	18.21446	144.70728		Old Alvin weights	not sampled
Diffuse Site (Alice Springs)	diffuse	18.21010	144.70735	3626	Diffuse site 21m NE of old Alice	sampled
Snail 001 (Mkr-131) (Alice Springs)	diffuse	18.21033	144.70731	3611	Diffuse flow with snails	sampled
Little Anemones (Alice Springs)	site	18.21054	144.70745	3598	Concentrated area of small anemones	sampled
Burke-WP6	site	18.18672	144.71800	3730	ORP-north anomaly	not sampled
Old Chimneys (Burke)	site	18.18619	144.71799		old chimneys near WP-06 (ORP anomaly_	not sampled
Snail Pit Mkr-234 (Burke)	diffuse	18.18257	144.71989	3630	Mkr-234 diffuse flow with snails (21m NW of Old Snail Pits)	sampled
First Snails Nav Marker (Burke)	diffuse	18.18238	144.72004		diffuse flow with snails	not sampled
Milky Crack Nav Marker	diffuse	18.18228	144.71990		diffuse flow	not sampled
Anemones (Burke)	site	18.18180	144.72000	3647	concentration of anemones (24m SW of Old Anemone Heaven)	not sampled
Bottle On Rope (Burke)	site	18.18189	144.71990		probable old marker or trash	not sampled
Milky Flow (Burke)	diffuse	18.18252	144.71996	3629	Diffuse flow area	sampled
Two Towers (Hafa Adai)	vent	16.96137	144.86667	3292	Large active chimney	sampled
Sequoia (Hafa Adai)	vent	16.96123	144.86713	3295	30-m chimney - active venting	sampled
Chimlet Garden (Hafa Adai)	vent	16.96135	144.86760	3294	Chimlet Garden - small sulfide chimneys (active)	not sampled
Alba (Hafa Adai)	vent	16.96127	144.86803	3295	Alba (active venting)	sampled

Name	Vent or Site	Latitude	Longitude	Depth	Description	Sampling
Hafa Adai-WP05	vent	16.96150	144.86843	3294	vent	not sampled
Voodoo (Hafa Adai)	diffuse	16.96175	144.86927	3290	Voodoo Crater (active diffuse venting)	sampled
Hafa Adai-WP07	diffuse	16.96093	144.87038	3292	vent	sampled
Hafa Adai-WP08	diffuse	16.96130	144.87100	3292	vent	sampled
Mami Wata (Hafa Adai)	diffuse	16.96100	144.87218	3294	Mami Wata	sampled
Hafa Adai-WP11	site	16.96842	144.86650	3285	Breached Cone Crater	not sampled
Stump of Mystery (Perseverance)	vent	15.48018	144.50772	3907	Stump of Mystery	sampled
slope chimney (Perseverance)	site	15.48025	144.50772		chimney on steep slope	not sampled
slope chimney (Perseverance)	site	15.48023	144.50778		chimney on steep slope	not sampled
old chimney (Perseverance)	site	15.48018	144.50763		lg chimney beyond Palisades	not sampled
Leaning Tower	vent	15.47991	144.50763	3912	Leaning Tower	sampled
Palisades (Perseverance)	vent	15.48001	144.50762	3915	Palisades	not sampled
old chimney (Perseverance)	site	15.47869	144.50786		old chimney	not sampled
old chimney (Perseverance)	site	15.47856	144.50751		old chimney	not sampled
old chimney (Perseverance)	site	15.47863	144.50771	0	old chimney	not sampled
Limpet Canyon (Perseverance)	diffuse	15.47989	144.50754	3913	diffuse venting	sampled

6.5 Dive Samples

All samples attempted are listed by dive in the Table 6.5-1. Those samples that were not successful are shaded in gray. Positions shaded in a lighter gray indicate an estimated position was applied after the dive (see section 6.4 about bad positions while stationary). A secondary table lists the original image associated with each sample. This image may not be an actual view of the sample being taken (such as during long HFS sampling runs when the camera was used to view the surrounding biology and landscape). The image file name and its time/date listing will provide some guidance in locating other imagery associated with the sample. See the discussion regarding image nomenclature in section 5 (Imagery).

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
Dive S34 - Daikoku									
S34-HFS-01	12/1/2016	22:46	S34-HFS-01 Start 22:46. Filtered Piston #1 in soft sediment surround by flatfish with low pH and 10deg above ambient temperature. On volcanoclastic sediment at 10cm depth; pump working fine. Stop 22:50. Tmax=23.6 Tavg=13.5 T2=14 Vol=600ml	21.32509	144.19170	410	198	10m East of <i>Okeanos</i> Fish Spa	Butterfield
S34-Bio-02	12/1/2016	23:05	S34-Bio-02 Start 23:05 Stop 23:17. Suction of fish into Chamber #6 2mm mesh. At least 4 fish seen in chamber.	21.32509	144.19170	410	196	10m East of <i>Okeanos</i> Fish Spa	Tunncliffe
S34-Bio-03	12/1/2016	23:25	S34-Bio-03 Start 23:23 Stop 23:32. Suction of fish in chamber #7 2mm mesh. Vehicle repositioned slightly forward. Quite a bit of sediment and only a few fish.	21.32509	144.19171	410	187	10m East of <i>Okeanos</i> Fish Spa	Tunncliffe
S34-HFS-04	12/2/2016	0:12	S34-HFS-04 Started 00:12 Stop 00:16. Unfiltered Piston #2. Tmax=74.3 Tavg=69.7 vol=602 T2=40. pH at this site was down to 4.1. Volcanoclastic sand near gas bubbles and sulfur smoke.	21.32509	144.19167	409	220	10m East of <i>Okeanos</i> Fish Spa	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S34-HFS-05	12/2/2016	0:17	S34-HFS-05 Start 00:17 Stop 00:22 Piston #3 at the exact same location as HFS-04. Tmax=70.5 Tavg=68.8 vol=603 T2=35.	21.32510	144.19167	409	220	10m East of <i>Okeanos</i> Fish Spa	Butterfield
S34-HFS-06	12/2/2016	0:29	S34-HFS-06 DNA filter #13 Start 00:29 Stop 00:46. Tmax=67.2 Tavg=59.9 vol=3002 T=35. (Julie Huber) at the same location as the previous HFS samples.	21.32510	144.19167	409	219	10m East of <i>Okeanos</i> Fish Spa	Huber
S34-Geo-07	12/2/2016	1:01	S34-Geo-07 Sulfur chimlet for Heidi. Placed in STBD forward box.	21.32510	144.19167	409	218	10m East of <i>Okeanos</i> Fish Spa	Berkenbosch
S34-Geo-08	12/2/2016	1:21	S34-Geo-08 Scoop of white-solid material that was near the chimlets. Going in the aft biobox in the STBD side of the box. Small piece fell off the scoop but still have a large piece.	21.32510	144.19167	409	221	10m East of <i>Okeanos</i> Fish Spa	Berkenbosch
S34-Bio-11A	12/2/2016	1:41	S34-Bio-11A Original location of fish trap deployment near FK16-Fish Spa on sulfur crust on edge. Mkr-132 deployed at site after trap deployed.	21.32493	144.19166	403	214	Mkr-132 FK-2016 Fish Spa	Tunncliffe
S34-Bio-09	12/2/2016	1:49	S34-Bio-09 Start 01:49. Stop 02:05. Suctioning fish into 1mm mesh chamber #5. Suction within 1m of the fish trap, further from the edge of the crust-ledge.	21.32493	144.19165	403	215	Mkr-132 FK-2016 Fish Spa	Tunncliffe
S34-Geo-10	12/2/2016	2:42	S34-Geo-10 Piece of sulfur crust from the edge of the sulfur pit. Had a fish nearby before taken. (Julie Huber)	21.32492	144.19162	403	180	Mkr-132 FK-2016 Fish Spa	Berkenbosch
S34-Bio-11B	12/2/2016	3:13	S34-Bio-11B Found location of Fish Trap. Second location after rolled down the hill. Grabbed it and redeployed at a third location.	21.32500	144.19161	407	156	downhill of Mkr-132 (FK-2016 Fish Spa)	Tunncliffe

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S34-Bio-11C	12/2/2016	3:24	S34-Bio-11C Deployed 03:24. Recovered 03:59. Fish trap at third location which is 12.5m SE from the original location at Mkr-132. Bearing is 122deg.	21.32488	144.19175	398	153	25m E of waypoint 2 (Sulfur pond)	Tunncliffe
S34-Geo-12	12/2/2016	4:04	S34-Geo-12 The sulfur that has adhered to the ROV will be collected as a sample. The sulfur was erupted from the pond as liquefied globules which cooled and stuck to the vehicle. Location is based on a general position over the pond.	21.32491	144.19152	402		Over sulfur pond	Berkenbosch

Dive S35 - Daikoku

S35-HFS-01	2016-12-02	23:09:08	S35-HFS-01 Filtered Piston #1. PVC piston. In sediment next to black-tape fish trap. Start 23:09. Stop 23:13. Tmax=23.6 Tavg=19.1 vol=750 T2=15.	21.32513	144.19161	410	169	6m EofN Fish Spa	Butterfield
S35-HFS-02	2016-12-02	23:16:48	S35-HFS-02 Start 23:16 Unfiltered Bag #16. At exact same location as previous sample. Stop 23:20. Tmax=21.6 Tavg=20.9 vol=530 T2=15	21.32513	144.19161	410	169	6m EofN Okeanos Fish Spa	Butterfield
S35-HFS-03	2016-12-02	23:21:40	S35-HFS-03 Start 23:21. RNA filter #14. Stop 23:37. Tmax=31.5 Tavg=29.8 vol=3000 T2=17. Exact same location as previous.	21.32512	144.19160	410	169	6m EofN Okeanos Fish Spa	Huber
S35-HFS-04	2016-12-02	23:41:57	S35-HFS-04 Start 23:41 Unfiltered piston #2. Stop 23:46. Tmax=29.2 Tavg=29.1 vol=700 T2=17 At same location.	21.32512	144.19160	410	167	6m EofN Okeanos Fish Spa	Butterfield
S35-HFS-05	2016-12-02	23:48:46	S35-HFS-05 Start 23:48. Stop 23:51. Filtered Bag #17. At exact same location.	21.32513	144.19161	410	167	6m EofN Okeanos Fish Spa	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S35-HFS-06	2016-12-03	00:05:08	S35-HFS-06 Start 00:05. Filtered Piston #3 Stop 00:08. Tmax=28.2 Tavg=19.0 vol=600 T2=15 Sample in same location but with the flush pump OFF.	21.32513	144.19161	410	166	6m EofN <i>Okeanos</i> Fish Spa	Butterfield
S35-HFS-07	2016-12-03	01:19:55	S35-HFS-07 Start 01:19. Unfiltered Bag #18. Stop 01:23. Tmax=13.5 Tavg=13.4 vol=500 T2=13.6 In ambient temperature sediment approximately 30m east of the waypoint at Fish Spa. Can see exhaust.	21.32503	144.19188	407	145	Mkr-133	Butterfield
S35-HFS-08	2016-12-03	01:24:05	S35-HFS-08 Start 01:24. Stop 01:26. Tmax=13.6 Tavg=13.5 vol=500 T2=13.7 Filtered Bag #19. At same location.	21.32503	144.19187	407	144	Mkr-133	Butterfield
S35-Bio-09	2016-12-03	01:45:35	S35-Bio-09 Suction sample of sediment near fish trap deployment 30m east of Fish Spa. Sample is in chamber #7.	21.32503	144.19188	407	143	Mkr-133	Tunncliffe
S35-Bio-10	2016-12-03	02:52:40	S35-Bio-10 Sample of about 8 tubeworms. Taken from the inside wall of the big crater near the rim. In the area of waypoint #2 (20m east and 5m north of <i>Okeanos</i> site).	21.32378	144.19229	355	137	20m E/5mN WP2 crater rim inside wall	Tunncliffe
S35-HFS-11	2016-12-03	03:09:26	S35-HFS-11 Start 03:09. Unfiltered Bag #20. Taken at the same location as the tubeworm sample. In a crack at the base of the worms. Inside the crater wall. Stop 03:13. Tmax=15.7 Tavg=15.6 vol=501 T2=15.7. Vehicle moved just at end of the sample.	21.32379	144.19230	355	139	20m E/5mN WP2	Butterfield
S35-Bio-12	2016-12-03	04:27:42	S35-Bio-12 Scoop of sediment near the recovered (but empty) fish trap and Mkr-137. Taking several swipes with the sediment scoop.	21.32421	144.19205	371	55	Mkr-137	Tunncliffe

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S35-HFS-13	2016-12-03	05:49:16	S35-HFS-13 Start 05:49. Unfiltered Piston #4. Stop 05:52. Tmax=42.3 Tavg=36.1 vol=480 T2=14. At waypoint 1 site Fish Spa.	21.32510	144.19162	409	164	<i>Okeanos</i> Fish Spa	Butterfield
S35-HFS-14	2016-12-03	05:53:33	S35-HFS-14 Start 05:53. Unfiltered Piston #8 Titanium. Stop 05:56. Tmax=43.7 Tavg=28.4 vol=602 T2=14. At same location.	21.32510	144.19163	409	164	<i>Okeanos</i> Fish Spa	Butterfield
S35-HFS-15	2016-12-03	05:58:54	S35-HFS-15 Start 05:58. LVB #24. Stop 06:15. Tmax=69.2 Tavg=45.9 vol=3800 T2=14. At the same location.	21.32510	144.19163	409	165	<i>Okeanos</i> Fish Spa	Huber
S35-HFS-16	2016-12-03	06:16:20	S35-HFS-16 Start 06:16. RNA Filter #13. Stop 06:29. Tmax=49.2 Tavg=33.2 vol=3000. At same exact location.	21.32510	144.19163	409	164	<i>Okeanos</i> Fish Spa	Huber
S35-Bio-17	2016-12-03	06:53	S35-Bio-17 Suction of a crab at the fluid sampling site near Fish Spa at 06:53. Did not know the crab was in chamber #4 until recovering the fish traps. Location of sample was 21deg 19.5017 (21.32336) 144deg 11.4962 (144.19160) 408m of depth.	21.32336	144.19160	408	178	8m S of <i>Okeanos</i> Fish Spa	Tunncliffe
S35-Bio-18	2016-12-03	07:16:05	S35-Bio-18 Crab suction into chamber 5. Looks like some were suctioned into chamber.	21.32502	144.19165	407	160	10m SE <i>Okeanos</i> Fish Spa	Tunncliffe
Dive S36 - Chamorro									
S36-Geo-01	2016-12-04	00:30:19	S36-Geo-01 . Sample of small chimney with animals. Location is at Waypoint #1 (venting site found by <i>Okeanos</i> Explorer). Small active chimney on a sulfide mound located on a broken up lava flow.	20.82146	144.70705	920	41	Waypoint 1	Berkenbosch

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S36-HFS-02	2016-12-04	00:44:55	S36-HFS-02 Start 00:44. Filtered Piston #1. Stop. 00:47 Tmax=154.7 Tavg=135. vol=550 At the sulfide just sampled on the sulfide mound in the broken up lava flow.	20.82150	144.70708	920	40	Waypoint 1	Butterfield
S36-HFS-03	2016-12-04	00:47:43	S36-HFS-03 Unfiltered piston #2. Start 00:47. Stop 00:49. Tmax=148 Tavg=107 vol=490 No exhaust. Exact same location.	20.82149	144.70707	920	40	Waypoint 1	Butterfield
S36-HFS-04	2016-12-04	00:50:52	S36-HFS-04 Start 00:50. Unfiltered Bag #16. Stop 00:53. Tmax=139 Tavg=120 vol=480 Can see exhaust with the bag sample. Flush pump is on. Same location.	20.82148	144.70707	920	40	Waypoint 1	Butterfield
S36-HFS-05	2016-12-04	00:53:20	S36-HFS-05 Start 00:53. Unfiltered Bag #18 Stop 00:55. Tmax=155.3 Tavg=149.4 vol=460 T2=40. At same location. Can see exhaust.	20.82150	144.70705	920	40	Waypoint 1	Butterfield

Dive S37 - Illium

S37-Geo-01	2016-12-05	01:10:19	S37-Geo-01. Old chimney downslope of Illium vent target. Old chimney on an old lava tube flow as we came up the slope. Squat lobsters at the base. Going in port-aft section of the forward biobox. (Piece went in STBD part of box as well).	18.21318	144.70730	3610	42	Old Chimney	Berkenbosch
S37-HFS-02	2016-12-05	02:16:15	S37-HFS-02 Start 02:16. Unfiltered Titanium Piston #1. Titanium. In the clump of snails just .5m from the robosnail. Wand tip buried half-way down in the snails. Not seeing exhaust. (No data.)	18.2136	144.70748	3583	323	Snail Pile Mkr-138	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S37-HFS-03	2016-12-05	02:19:21	S37-HFS-03 Start 02:19. Piston #2 Unfiltered titanium. Stop 02:28. Tmax=27.4 Tavg=26.8 vol=193. No exhaust visible. Same location.	18.2136	144.70748	3583	323	Snail Pile Mkr-138	Butterfield
S37-HFS-04	2016-12-05	02:30:45	S37-HFS-04 Start 02:30 Unfiltered bag #16. Stop 02:33. Tmax=28.7 Tavg=25.8 vol=402. T2=2.2 Visible exhaust flow. Same location.	18.2136	144.70748	3583	323	Snail Pile Mkr-138	Butterfield
S37-HFS-05	2016-12-05	02:34:49	S37-HFS-05 Start 02:34. Filtered Bag #17. No flow in exhaust. Stop 02:37. Tmax=27.0 Tavg=23.6 vol=454 T2=8. Same location.	18.2136	144.70748	3583	323	Snail Pile Mkr-138	Butterfield
S37-HFS-06	2016-12-05	02:39:15	S37-HFS-06 Start 02:39. LVB #24. Stop 03:06 Tmax=32.3 Tavg=30.4 vol=3297 T2=13 Seeing some bubbles and fresh water from exhaust. Same location.	18.2136	144.70748	3583	323	Snail Pile Mkr-138	Huber
S37-HFS-07	2016-12-05	03:07:41	S37-HFS-07 Start 03:07. Unfiltered bag #18. Stop. 03:10 Tmax=27.6 Tavg=21.8 vol=500. T2=10 Sample probably not good-no exhaust. Same location in robosnail patch.	18.2136	144.70748	3583	323	Snail Pile Mkr-138	Butterfield
S37-HFS-08	2016-12-05	03:14:29	S37-HFS-08 Start 03:14. Filtered DNA #11. Stop 03:27. Tmax=24.1 Tavg=20.6 vol=3000 T2=10. Same location.	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Huber
S37-HFS-09	2016-12-05	03:29:04	S37-HFS-09 Unfiltered piston #8. Start 03:29. Stop 03:37. Tmax=32.8 Tavg=28.2 vol=637 T2=13. Same location.	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Butterfield
S37-Bio-10	2016-12-05	03:54:59	S37-Bio-10 Scoop of biology in the same location as HFS samples. Mainly snails but other species in scoop.	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Tunncliffe

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S37-HFS-11	2016-12-05	03:58:06	S37-HFS-11 Background sample (wand is in holster). Unfiltered Bag #20. At the robosnail site. Not seeing any flow. Stop 04:00. Tmax=2.7 Tavg=2.6 vol=500 T2=2.25.	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Butterfield
S37-HFS-12	2016-12-05	04:02:07	S37-HFS-12 Start 04:02 Filtered bag #21. Stop 04:03. Tmax=2.6 Tavg=2.5 vol=500 T2=2.4 Background sample (wand in holster).	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Butterfield
S37-Bio-13	2016-12-05	04:03:58	S37-Bio-13 Suction of small biology bits into container #2. Mesh size=500. Few shrimp as well. Lifted up clumps of snails to get underneath while suctioning.	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Tunncliffe
S37-Bio-14	2016-12-05	04:08:11	S37-Bio-14 Suction into jar #3. Trying to get some shrimp. Jar contains shrimp and snail.	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Tunncliffe
S37-HFS-15	2016-12-05	04:12:14	S37-HFS-15 Start 04:12. Filtered Piston #3. Stop 04:17. Tmax=2.9 Tavg=2.7 vol=700 T2=2.6 Background.	18.2136	144.70748	3582	323	Snail Pile Mkr-138	Butterfield

Dive S39 - Alice Springs

S39-HFS-01	2016-12-06	03:40:11	S39-HFS-01 Start 03:40. Unfiltered Piston #2. Stop. Tmax=7.8 Tavg=7.4 vol=597 T2=4 Have good flow.	18.21010	144.70735	3626	348	Diffuse site 22m NE of old Alice Springs	Butterfield
S39-HFS-02	2016-12-06	04:24:59	S39-HFS-02 Start 04:24. Filtered Piston #1. Stop 04:28 Tmax=126.5 Tavg=124.2 T2=26 vol=550. At the focused flow at the nav marker snail-001 site where the ROV had a high temperature of 158deg.	18.2103	144.70731	3611	307	Mkr-131 Snail-001 Site	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S39-HFS-03	2016-12-06	04:30:30	S39-HFS-03 Start 04:30. Unfiltered Piston #8. Stop. Tmax=161.4 Tavg=158.5 vol=700 T2=32. Using barbed to six-port. Seeing exhaust.	18.2103	144.70731	3611	307	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-04	2016-12-06	04:37:12	S39-HFS-04 Start 04:37. Filtered Piston #7. Stop 04:38. Tmax=161.4 Tavg=161.2 vol=250 T2=30 Don't think it worked. At same location snail-001 near the robosnail deployment.	18.2103	144.70731	3611	307	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-05	2016-12-06	04:39:59	S39-HFS-05 Start 04:39. Filtered Piston #3. Stop. Tmax=164.8 Tavg=163.1 T2=32 vol=606 Looks like it is working.	18.2103	144.70731	3611	307	Mkr-131 Snail-001 Site	Butterfield
S39-GTB-06	2016-12-06	05:14:07	S39-GTB-06 Fired. Yellow #9 GTB. In the hole with good verification of the wand tip in the pilot camera. Sample looked really good.	18.2103	144.70731	3611	312	Mkr-131 Snail-001 Site	Lupton
S39-HFS-07	2016-12-06	06:11:19	S39-HFS-07 Start 06:11. LVB #24 Stop 06:35. Tmax=67.7 Tavg=35.2 vol=3217 T2=16. Temperature started at about 44-45deg.	18.2103	144.70731	3611	237	Mkr-131 Snail-001 Site	Huber
S39-HFS-08	2016-12-06	06:37:39	S39-HFS-08 Start 06:37. Unfiltered Piston #4 Stop. Tmax=33.4 Tavg=26 vol=601 T2=10. At the same location as the LVB. Near the crack with the 2 snails.	18.2103	144.70731	3611	234	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-09	2016-12-06	06:43:31	S39-HFS-09 Start 06:43. Unfiltered Bag #20. Stop 06:47. Tmax=40.5 Tavg=32 vol=600 T2=13. Same exact location as the last one.	18.2103	144.70731	3611	234	Mkr-131 Snail-001 Site	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S39-HFS-10	2016-12-06	06:49:16	S39-HFS-10 Start 06:49. DNA Filter #10. Stop. Tmax=78 Tavg=42 vol=2944 T2=25. Same location.	18.2103	144.70731	3611	234	Mkr-131 Snail-001 Site	Huber
S39-Geo-11	2016-12-06	07:24:21	S39-Geo-11 Rock is for Biologist Aft-port quarter of the forward biobox. Collected with an anemone on it just below the snails.	18.2103	144.70731	3611	234	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-12	2016-12-06	07:27:44	S39-Bio-12 One mussel taken near the rock and last fluid sample site below the snails. Mussel was damaged while sampling. In aft-stbd quarter of forward biobox.	18.2103	144.70731	3611	234	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-13	2016-12-06	07:35:19	S39-Bio-13 Scooped once but they came out when scoop was jostled. Will try some more.	18.2103	144.70731	3611	234	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-14	2016-12-06	07:51:04	S39-Bio-14 Suction sample of biology. Same location into jar #2. 500 mesh.	18.2103	144.70731	3611	230	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-15	2016-12-06	09:06:07	S39-Bio-15 Got one in the grips. Rock with little zooanthids and large anemone on it. Into right forward bio box partition.	18.21054	144.70745	3598	299	Little Anemones	Tunncliffe
S39-HFS-16			Background 900m at end of dive					900m background	Butterfield

Dive S40 - Burke

S40-Bio-01	2016-12-07	01:41:54	S40-Bio-01 .Suction sample of shrimp into jar 4. About 15 snails in the jar #4.	18.18257	144.71989	3630	3	Snail Pit Mkr-234	Tunncliffe
S40-Bio-02	2016-12-07	01:50:10	S40-Bio-02. Suctioning to the left of the robosnail. Suctioning up the crud.	18.18257	144.71989	3630	2	Snail Pit Mkr-234	Tunncliffe
S40-Bio-03	2016-12-07	01:59:53	S40-Bio-03 Suction hold of a mussel and then extruded into the forward-stbd portion of the forward biobox.	18.18257	144.71989	3630	2	Snail Pit Mkr-234	Tunncliffe

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S40-Geo-04	2016-12-07	02:07:59	S40-Geo-04 Rock with biology for Verena. To the right of the robosnail. Had limpets on it. Went into the aft-stbd quadrant of the forward biobox.	18.18257	144.71989	3630	2	Snail Pit Mkr-234	Tunncliffe
S40-HFS-05	2016-12-07	02:38:58	S40-HFS-05 .Start 02:38. Filtered Piston #1. Stop. Tmax=51.5 Tavg=50.7 vol=569 T2=19. At the exact location of the last sensor reading just a few inches to the right of the robosnail. Not seeing exhaust flow.	18.18257	144.71989	3630	2	Snail Pit Mkr-234	Butterfield
S40-HFS-06	2016-12-07	02:43:09	S40-HFS-06 Start 02:43 Unfiltered Piston #2. Stop. Tmax=49.8 Tavg=39.7 vol=872 Did not stop on its own so probably no good. Not seeing any flow. Same exact location.	18.18257	144.71989	3630	2	Snail Pit Mkr-234	Butterfield
S40-HFS-07	2016-12-07	02:49:23	S40-HFS-07 Start 02:49. Unfiltered Bag #22 There is flow in the exhaust. Stop. Tmax=42.2 Tavg=39.4 vol=400 T2=16. Same exact location to the right of the robosnail.	18.18257	144.71989	3631	2	Snail Pit Mkr-234	Butterfield
S40-HFS-08	2016-12-07	02:53:05	S40-HFS-08 Start 02:53. Filtered Bag #21. Stop. Tmax=47.2 Tavg=43.6 vol=400 T2=16.17 Can see flow/exhaust. Same location.	18.18257	144.71989	3631	2	Snail Pit Mkr-234	Butterfield
S40-HFS-09	2016-12-07	02:59:36	S40-HFS-09 Start 02:59. LVB #24 at the same location. Stop 03:22 Tmax=49.5 Tavg=42.7 vol=3318 T2=17. Good flow in exhaust.	18.18257	144.71989	3631	2	Snail Pit Mkr-234	Huber
S40-HFS-10	2016-12-07	03:24:12	S40-HFS-10 Start 03:24. RNA Filter #11 Stop 03:50 Tmax=48.8 Tavg=37.4 vol=3000 T2=17 (High temp occurred just at end). At the same location.	18.18257	144.71989	3631	2	Snail Pit Mkr-234	Huber

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S40-HFS-11	2016-12-07	03:54:15	S40-HFS-11 Start 03:54. Unfiltered Piston #8 Seeing good exhaust. Stop 03:58 Tmax=48.7 Tavg=45.5 vol=650 T2=17 Good sample. Same location to the right of the robosnail.	18.18257	144.71989	3631	2	Snail Pit Mkr-234	Butterfield
S40-Bio-12	2016-12-07	04:05:49	R40-Bio-12 Sample of snails hitchhiking on the robosnail.	18.18257	144.71989	3631	2	Snail Pit Mkr-234	Bates
S40-Bio-13	2016-12-07	04:08:08	S40-Bio-13 Suction of snails that were located under the Robosnail into Jar #7.	18.18257	144.71989	3631	360	Snail Pit Mkr-234	Bates
S40-HFS-14	2016-12-07	04:26:47	S40-HFS-14 Start 04:26 Unfiltered Bag #20. Stop 04:39 Tmax=11.0 Tavg=10.2 vol=400 T2=6	18.18252	144.71996	3629	172	Milky Flow	Butterfield
S40-HFS-15	2016-12-07	04:30:05	S40-HFS-15 Start 04:30. Filtered Bag #19. Same location in the milky flow as #20. Stop 04:32 Tmax=11.1 Tavg=9.8 vol=400 T2=5.5	18.18252	144.71996	3629	172	Milky Flow	Butterfield

Dive S41 - Hafa Adai

S41-Geo-01	2016-12-07	23:53:18	S41-Geo-01. Piece of chimney that had fallen on top of the flange on the east side of the Two Towers Chimney. About 13m up the chimney on east side.	16.96133	144.86657	3271	248	Two Towers	Berkenbosch
S41-GTB-02	2016-12-08	02:19:59	S41-GTB-02 Red-green taken from the same orifice the 302deg fluid was measured with the ROV wand. From the west side of the chimney near the base but where the active venting began. Saw the firing as it sucked the water in.	16.96115	144.86696	3274	83	Sequoia	Lupton

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S41-Bio-03	2016-12-08	02:34:29	S41-Bio-03 Suction of snails located to the right of the gas tight sample. Going to jar #7 with a 2mm mesh.	16.96115	144.86696	3274	81	Sequoia	Tunncliffe
S41-Bio-04	2016-12-08	02:55:44	S41-Bio-04 Suction of small-red shrimp into jar #5. Still on the west side of the chimney where the gas tight was taken.	16.96115	144.86696	3274	110	Sequoia	Tunncliffe
S41-Bio-05	2016-12-08	03:01:25	S41-Bio-05 Suction of 'crud' and some small shrimp into jar #3. Same location as the previous biology suction.	16.96115	144.86696	3274	111	Sequoia	Tunncliffe
S41-HFS-06	2016-12-08	03:28:38	S41-HFS-06 Start 03:28 Unfiltered piston #8. Stop Tmax=132.5 Tavg=110 vol=600 T2 32. With good flow. Tip is in the minerals.	16.96115	144.86696	3274	136	Sequoia	Butterfield
S41-HFS-07	2016-12-08	03:34:44	S41-HFS-07 Start 03:34 Filtered Piston #3 Stop. Tmax=85.5 Tavg=76 vol=500 T2=27. At the same exact location as the unfiltered piston. Good exhaust.	16.96115	144.86696	3274	136	Sequoia	Butterfield
S41-Geo-08	2016-12-08	03:49:58	S41-Geo-08 Piece of smoking chimney just above where the last fluid samples were taken on the west side of the 30m chimney. Fragments of the chimney.	16.96115	144.86696	3275	122	Sequoia	Berkenbosch
S41-Geo-09	2016-12-08	04:07:24	S41-Geo-09 Got a piece of the second rock (which broke the scoop) Forward-stbd portion of the biobox with the last geo sample.	16.96115	144.86696	3274	110	Sequoia	Berkenbosch
S41-Bio-10	2016-12-08	07:16:22	S41-Bio-10 Suction of white snails into jar #6 from a cluster of 4. Looked like all four went into the hose but only one has come into the jar.	16.96079	144.87041	3280	236	Waypoint 7	Tunncliffe

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S41-Geo-11	2016-12-08	07:21:47	S41-Geo-11 Inactive sulfide that was on the top of the chimney at waypoint #7. Looking to the west.	16.96076	144.87040	3281	268	Waypoint 7	Berkenbosch
Dive S42 - Hafa Adai									
S42-HFS-01	2016-12-08	23:40:33	S42-HFS-01 Start 23:40. Unfiltered Bag #22 Stop. Tmax=25.6 Tavg=21.0 vol=425 T2=12.2	16.96172	144.86921	3278	3	Hula array	Butterfield
S42-HFS-02	2016-12-08	23:44:18	S42-HFS-02 Start 23:44. Filtered Bag #21. Stop. Tmax=30.5 Tavg=25.7 vol=425 T2=12.1 At the same location as HFS-01	16.96174	144.86919	3278	2	Hula array	Butterfield
S42-HFS-03	2016-12-09	00:19:07	S42-HFS-03 Start 00:19. Unfiltered Piston #1 Stop Tmax=124 Tavg=120 vol=650 T2=40. This is the hole inside the temperature array with hotter water.	16.96171	144.86922	3278	0	Hula array	Butterfield
S42-HFS-04	2016-12-09	00:24:27	S42-HFS-04 Start 00:24 Filtered Piston #3 Stop. Tmax=128.1 Tavg=126 vol=308 T2=40. Same location as reading #8 inside the temperature array near Mkr-171.	16.96174	144.86921	3278	359	Hula array	Butterfield
S42-HFS-05	2016-12-09	00:31:54	S42-HFS-05 Start 00:31. LVB #24 at location #8 in the array. Stop 00:53. Tmax=100.3 Tavg=38.6 vol=3228 T2=20. Brought wand up from hot water just sampled at same exact location a few inches to get cooler water.	16.96173	144.86921	3278	359	Hula array	Huber
S42-HFS-06	2016-12-09	00:55:48	S42-HFS-06 Start 00:55 RNA filter #10 At location #8 (of array readings) inside the temperature array near Mkr-171. Stop 01:21. Tmax=58.6 Tavg=30.2 vol=3000 T2=20. Same exact location as HFS-05.	16.96174	144.86924	3278	353	Hula array	Huber

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S42-HFS-07	2016-12-09	01:35:24	S42-HFS-07 Start 01:35 Unfiltered Bag#20. Stop 01:38. Tmax=7.1 Tavg=6.0 vol=452 T2=5.4 Location near the edge of the array near the last reading but after the vehicle was bumped.	16.96170	144.86921	3278	350	Hula array	Butterfield
S42-HFS-08	2016-12-09	01:39:52	S42-HFS-08 Start 01:39 Filtered Bag #19 Stop 01:44. Tmax=6.1 Tavg=5.2 vol=450 T2=4.7 Same location as HFS-07 near Location #9 in the array at Mkr-171 (started a bit later as valve needed to move).	16.96177	144.86920	3278	350	Hula array	Butterfield
S42-Bio-09	2016-12-09	02:18:01	S42-Bio-09 Suction of many dead snails into Jar #7.	16.96174	144.86911	3284	160	Snail Graveyard	Tunncliffe
S42-Bio-10	2016-12-09	02:40:26	S42-Bio-10 Suction of a single white snail (alive) in the Snail Graveyard. Placed in the aft-aft quadrant of the biobox. I	16.96173	144.86906	3284	165	Snail Graveyard	Tunncliffe
S42-Bio-11	2016-12-09	02:42:27	S42-Bio-11 Full strength suction of crud into Jar #4 at the Snail Graveyard. A couple of suctions under the dead shells.	16.96175	144.86910	3284	160	Snail Graveyard	Tunncliffe
S42-Geo-12	2016-12-09	02:54:07	S42-Geo-12 Rock holding the barnacles. Located above the snail grave yard on the south inside rim of the cone.	16.96168	144.86920	3278	119	Rim above graveyard	Tunncliffe
S42-Geo-13	2016-12-09	03:17:21	S42-Geo-13 Piece of altered rock from the outside of the cone on the NE side. About fist-sized put in the aft-port quarter of the forward biobox.	16.96197	144.86935	3285	227	outside wall NE Voodoo	Berkenbosch
S42-Geo-14	2016-12-09	03:31:23	S42-Geo-14 Small piece in port-forward quarter of small biobox. Need to get another piece.	16.96148	144.86873	3285	222	sheet flow west of Voodoo	Berkenbosch

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S42-HFS-15	2016-12-09	04:09:37	S42-HFS-15 Start 04:09 On the NE side of Sequoia at 25m altitude (about 6m from the top). Unfiltered Piston #2 In the black smoke after breaking off about an inch of this chimney. Stop 04:12. Tmax=274.6 Tavg=261 vol=603 T2=63.	16.96116	144.86699	3261	219	NE Sequoia 25m up	Butterfield
S42-HFS-16	2016-12-09	04:15:13	S42-HFS-16 Start or:15 Filtered Piston #5. Stop 04:21. Tmax=209.9 Tavg=163 vol=640 T2=30.Same location as HFS-15 and looks like tip has not moved.	16.96115	144.86699	3261	219	NE Sequoia 25m up	Butterfield
S42-HFS-17	2016-12-09	04:38:56	S42-HFS-17 Start 04:38 Unfiltered Piston #8 Stop 04:42. Tmax=271.5 Tavg=256.9 vol=650 T2=63.Same exact location with slight movement to get the hottest water.	16.96115	144.86700	3261	219	NE Sequoia 25m up	Butterfield
S42-HFS-18	2016-12-09	04:45:29	S42-HFS-18. Start 04:45 Unfiltered Piston #6 Stop 04:50. Tmax=338.4 Tavg=332 vol=790 T2=78.Same exact location with a bit higher temperature.	16.96115	144.86700	3261	218	NE Sequoia 25m up	Butterfield
S42-HFS-19	2016-12-09	04:51:49	S42-HFS-19 Start 04:51. Unfiltered Piston #4. Stop 04:56. Tmax=345.9 Tavg=343 vol=650 T2=79.Same exact location.	16.96115	144.86700	3261	218	NE Sequoia 25m up	Butterfield
S42-Geo-20	2016-12-09	05:05:05	S42-Geo-20 Chimney from Sequoia that was knocked down when trying to get the other chimney that fell on top of the biobox. ROV in same location as the previous HFS samples.	16.96115	144.86701	3261	218	NE Sequoia 25m up	Berkenbosch

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S42-GTB-21	2016-12-09	05:58:59	S42-GTB-21 Fired when saw deflection in the black smoke. Tip moved when the ram was fired (moved away from orifice when it was fired). Same orifice as sampled with HFS. Yellow-Green #12.	16.96116	144.86696	3261	134	NE Sequoia 25m up	Lupton
S42-Geo-22	2016-12-09	06:42:19	S42-Geo-22 Piece of sulfide from base of Sequoia. Going in aft-stbd large biobox.	16.96123	144.86706	3279	198	Sequoia base	Berkenbosch
S42-Geo-23	2016-12-09	07:35:05	S43-Geo-23 Blue-colored chimlet from wild-looking chimney upon arriving at Waypoint #8. Top of chimney was venting. Maybe animals on the chimney.	16.96117	144.87088	3282	112	Chimney at WP-08	Berkenbosch

Dive S43 - Hafa Adai

S43-Geo-01	2016-12-09	23:21:10	S43-Geo-01 Piece of lava from a collapse feature taken from outside of the cone near waypoint 10. Placed in aft-port quarter of biobox.	16.96820	144.86493	3280	152	West of Breached Cone	Chadwick
S43-Geo-02	2016-12-10	01:01:40	S43-Geo-02 Piece of old altered chimney due S of the cone. South of WP 14. In sheet flows.	16.96533	144.86710	3285	183	South of Breached Cone	Berkenbosch
S43-HFS-03	2016-12-10	02:04:28	S43-HFS-03 Start 02:04 Unfiltered Bag #16 Stop 02:21. Tmax=13.3 Tavg=9.6 vol=559 T2=4. Not a good sample. Base of Alba Vent in a crack where the shimmering water is coming over. Can see some exhaust.	16.96126	144.86782	3277	101	Alba Vent	Butterfield
S43-HFS-04	2016-12-10	02:45:29	S43-HFS-04 Start 02:45. Filtered Piston #1. Stop 02:51. Tmax=209 Tavg=166 vol=650 T2=10. Seeing some flow in the exhaust but not strong. Vent that was excavated slightly.	16.96127	144.86786	3277	88	Alba Vent	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S43-HFS-05	2016-12-10	02:53:33	S43-HFS-05 Start 02:53 Unfiltered Piston #2. Stop 03:02. Tmax=219 Tavg=193 vol=625 T2=50. Same location as HFS-04 on the lower part of Alba Vent. Running the flush pump on this one. Can see some exhaust flow.	16.96127	144.86787	3277	87	Alba Vent	Butterfield
S43-HFS-06	2016-12-10	03:04:55	S43-HFS-06 Start 03:04 Filtered Piston #3 Stop 03:13. Tmax=238.6 Tavg=120 vol=800 T2=50. Same exact location as the last two samples.	16.96125	144.86787	3277	86	Alba Vent	Butterfield
S43-GTB-07	2016-12-10	04:01:47	S43-GTB-07 Fired. White #17. In the black smoke in the smoker in the back of the small chimney in front. When fired saw the wand go further in the orifice. Same hole as the HFS samples here but at a slightly different angle.	16.96124	144.86785	3278	89	Alba Vent	Lupton
S43-Geo-08	2016-12-10	04:20:48	S43-Geo-08 Sulfide sample of the black smokers in the same area that HFS and gastights taken. Pieces of chimney fell into net after claw excavated in two places.	16.96125	144.86782	3278	92	Alba Vent	Berkenbosch
S43-HFS-09	2016-12-10	04:30:50	S43-HFS-09 Start 04:30 LVB #24. Stop 04:53. Tmax=16.3 Tavg=14.7 vol=3200ml T2=8. In diffuse flow just below the black smokers sampled near the base of Alba Vent. See exhaust.	16.96131	144.86782	3277	99	Alba Vent	Huber
S43-HFS-10	2016-12-10	04:54:59	S43-HFS-10 Start 04:54 RNA Filter #10 Stop. Tmax=16.4 Tavg=14.1 vol=3002 T2=8. Same location as LVB HFS-09.	16.96122	144.86785	3277	96	Alba Vent	Huber

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S43-HFS-11	2016-12-10	05:24:49	S43-HFS-11 Start 05:24 Unfiltered Bag #22 Stop 05:27. Tmax=16.7 Tavg=16 vol=401 T2=8At the same site as the LVB sample on Alba Vent.	16.96126	144.86786	3277	93	Alba Vent	Butterfield
S43-HFS-12	2016-12-10	05:28:12	S43-HFS-12 Start 05:28 Filtered Bag #21. Stop 05:30. Tmax=16.6 Tavg=15.5 T2=9 vol=403 Same exact location as HFS-13 and LVB.	16.96126	144.86785	3277	94	Alba Vent	Butterfield
S43-HFS-13	2016-12-10	05:31:41	S43-HFS-13 Start 05:31 Unfiltered Bag #20 Stop 05:34. Tmax=16.1 Tavg=15.4 T2=8.5 vol=401ml/l. Same exact location as LVB and previous HFS sample.	16.96126	144.86785	3277	93	Alba Vent	Butterfield
S43-Bio-14	2016-12-10	06:19:04	S43-Bio-14 SPME #4 Puck squeezing in the diffuse flow of the LVB sample at Alba Vent. Stopped 06:32.	16.96126	144.86787	3277	64	Alba Vent	Tunncliffe

Dive S44 - Hafa Adai

S44-Geo-01	2016-12-11	01:36:14	S44-Geo-01 Big lava rock taken south of waypoint #9 upon arriving on the seafloor at Hafa Adai. Looks like about 20m due south of waypoint. Older lavas with some sulfides.	16.96076	144.87231	3284	94	south of Mami Wata	Chadwick
S44-HFS-02	2016-12-11	02:11:21	S44-HFS-02 Start 02:11. Stop 02:19 Unfiltered Piston #2 with good exhaust. Stop Tmax=13.3 Tavg=7.6 vol=393 ml T2=5. Near Waypoint #9 20m Mami wata Vent (Water goddess)	16.96084	144.87199	3285	137	Mami Wata	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S44-HFS-03	2016-12-11	03:54:38	S44-HFS-03 Filtered Piston #1. Stop. Tmax=331.8 Tavg=327.5 vol=260 T2=66 Right in the black smoke at the top of Two Towers. Great location. Can see exhaust.	16.96131	144.86653	3269	349	Two Towers	Butterfield
S44-HFS-04	2016-12-11	04:05:17	S44-HFS-04 Unfiltered Piston #3 Stop Tmax=342.3 Tavg=333.5 vol=520 T2=65 At the top of Two Towers same chimlet at the first sample.	16.96131	144.86653	3269	347	Two Towers	Butterfield
S44-HFS-05	2016-12-11	04:10:10	S44-HFS-05 Temp is stable at 345ish. Stop. Tmax=348. Tavg=346.7 vol=601 T2=74. Still at the same chimlet with great placement.	16.96131	144.86653	3269	343	Two Towers	Butterfield
S44-GTB-06	2016-12-11	04:23:40	S44-GTB-06 Fired and saw it suck up in perfect position. In the same chimlet as the HFS samples. Good deflection of the flow.	16.96131	144.86653	3269	335	Two Towers	Lupton
S44-Geo-07	2016-12-11	04:37:01	S44-Geo-07 From the chimlet that the water & gas samples were taken. Tiny piece in the jaw. Put in the STBD-aft biobox. Some pieces on the sled.	16.96131	144.86653	3269	322	Two Towers	Berkenbosch
S44-Geo-08	2016-12-11	05:11:46	S44-Geo-08 Sample of sulfide just outside the cone on the west wall. Material is definitely not basalt as it crumbles easily. In the port-front biobox in the stbd-forward quarter.	16.96146	144.86867	3284	118	Outside Voodoo Crater	Berkenbosch
S44-HFS-09	2016-12-11	05:41:58	S44-HFS-09 Start 05:41. Unfiltered Piston #5 at recorder #6 inside the array at Voodoo. Stop. Tmax=32.3 Tavg=30.0 vol=486 T2=12. Not seeing good flow on this one in the exhaust.	16.96175	144.86924	3278	85	Hula array	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S44-HFS-10	2016-12-11	05:45:23	S44-HFS-10 Start 05:45. Unfiltered Piston #6 Stop. Tmax=32.5 Tavg=23.5 vol=700 T2=10. Same exact location. Not seeing exhaust again.	16.96174	144.86924	3278	85	Hula array	Butterfield
S44-HFS-11	2016-12-11	05:52:35	S44-HFS-11 Start 05:52. Filtered Bag #19. Stop. Tmax=31.2 Tavg=27 vol=450 T2=11 Getting good exhaust.	16.96176	144.86920	3278	85	Hula array	Butterfield
S44-HFS-12	2016-12-11	05:57:49	S44-HFS-12 LVB #24 Stop. Tmax=35 Tavg=29.7 vol=3402 T2=12. Near recorder 6 in the Hula array at the same location as the last samples.	16.96176	144.86919	3278	85	Hula array	Huber
S44-HFS-13	2016-12-11	06:22:21	S44-HFS-13 DNA Filter #10 Same location as LVB and previous water samples in the Hula array. Stop. Tmax=37.4 Tavg=30.9 vol=3002 T2=11.	16.96176	144.86921	3278	86	Hula array	Huber
S44-HFS-14	2016-12-11	06:49:00	S44-HFS-14 Start 06:49 Filtered Bag #16 Stop Tmax=37.7 Tavg=34.9 vol=451 T2=12.5 At the same exact location in the Hula array.	16.96174	144.86920	3278	86	Hula array	Butterfield
S44-Bio-15	2016-12-11	07:30:43	S44-Bio-15 in the Hula array at the low-T HFS sample site within the array. Hula array just lifted away. Going into jar #7.	16.96175	144.86919	3278	85	Hula array	Tunncliffe
S44-Bio-16	2016-12-11	07:35:58	S44-Bio-16 Start suction of snails. This is the 30degC HFS sample site within the array. Put into jar #6.	16.96174	144.86921	3278	83	Hula array	Tunncliffe
S44-HFS-17	2016-12-11	07:48:17	S44-HFS-17 Start 07:48. Unfiltered Piston #8. Stop. Tmax=91.7 Tavg=86.6 vol=596 In the maximum heat area under the hula array after the array was lifted.	16.96176	144.86919	3278	81	Hula array	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S44-HFS-18	2016-12-11	07:55:45	S44-HFS-18 Start 07:55 Unfiltered Piston #7. Stop. Tmax=107 Tavg=87 vol=537 Same place in the high-T flow.	16.96175	144.86920	3278	79	Hula array	Butterfield
S44-HFS-19	2016-12-11	08:00:10	S44-HFS-19 Start 08:00 .Filtered bag #17. Stop. Tmax=95.1 Tavg=54.8 vol=400 T2=20bGood exhaust. Same location.	16.96174	144.86920	3278	79	Hula array	Butterfield
S44-HFS-20			background SW end of dive 2000-1900m					Background water	Butterfield

Dive S45 - New Lava

S45-Geo-01	2016-12-12	01:36:31	S45-Geo-01 Piece of new lava about 10m west of waypoint #1 in the new lava flow. Port-forward quarter of forward milk crate.	15.43023	144.50347	4045	292	10m W of WP-01	Chadwick
S45-Geo-02	2016-12-12	02:02:52	S45-Geo-02 Lava toe from the base of a pillow. Taken near the base of the scarp south of waypoint #1. Port box in bin #7.	15.42966	144.50392	4112	310	60m S of WP-01	Chadwick
S45-Geo-03	2016-12-12	02:49:21	S45-Geo-03 Piece of crust from the pillow taken going up the slope toward waypoint #3. Taken with stbd arm. In compartment #1 of the stbd-milk crate.	15.42663	144.50501	4107	188	between WP-02 & WP-03	Chadwick
S45-Geo-04	2016-12-12	03:50:03	S45-Geo-04 Lava sample from a claw-like finger taken near waypoint #5 on a hill. Going in the port forward crate and piece went into compartment #10. Looks like a toe. Remaining pieces into bin #9.	15.42443	144.50331	4099	40	near WP-05	Chadwick

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S45-Geo-05	2016-12-12	04:08:54	S45-Geo-05 Piece from the top crust of an older pillow. Taken at the contact between the new flow and older flow about 10m SW of waypoint #6.	15.42426	144.50275	4140	319	10m SW of WP-06	Chadwick
S45-Geo-06	2016-12-12	04:54:32	S45-Geo-06 Grabbed a triangular piece of older pillow crust due west of Waypoint #7 (navigation jumps). Sample went into bin #3 in the STBD milk crate.	15.4218	144.50415	4063	112	125m W of WP-07	Chadwick

Dive S47 - Perseverance

S47-HFS-01	2016-12-16	07:39:11	S47-HFS-01 Start Unfiltered Bag #16. Stop 07:41. Tmax=43.2 Tavg=37.9 vol=403 T2=15 Believe we are close to waypoint 7 but big bathy offset and will have to determine this later.	15.4799	144.50763	3913	11	Leaning Tower	Butterfield
S47-HFS-02	2016-12-16	07:43:19	S47-HFS-02 Start. Filtered Piston #1 Not good exhaust. Start/stop pump. Stop 07:45. Tmax=40.0 Tavg=22.8 vol=350 T2=10 Not a good sample. Same exact location as HFS-01	15.4799	144.50763	3913	11	Leaning Tower	Butterfield
S47-HFS-03	2016-12-16	07:50:23	S47-HFS-03. Start 07:50 Unfiltered Piston #2. Not seeing exhaust. Stop 07:52. Tmax=33.7 Tavg=31.1 vol=250 T2=11 Not good sample.	15.4799	144.50763	3913	11	Leaning Tower	Butterfield
S47-HFS-04	2016-12-16	07:53:25	S47-HFS-04 Start 07:53 Filtered Bag #17 Stop 08:02. Tmax= 26.5, ave= 23.2, vol= 414, T2= 9 Good flow.	15.4799	144.50763	3913	11	Leaning Tower	Butterfield
S47-HFS-05	2016-12-16	08:07:32	S47-HFS-05 Start 08:07. LVB #24. Stop 08:30. Tmax= 40.8, ave 33.7, vol= 3400, T2= 15	15.4799	144.50763	3913	10	Leaning Tower	Huber

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S47-HFS-06	2016-12-16	08:32:01	S47-HFS-06 Start 08:32 DNA Filter #10. Stop 08:56. Tmax=45.5 Tavg=37.7 vol=2723ml. T2=12 At the same exact location as the previous sample.	15.4799	144.50763	3913	10	Leaning Tower	Huber
S47-Bio-07	2016-12-16	09:08:32	S47-Bio-07 Suction of snails (got a few shrimp as well). At the same site as the HFS samples. Into Jar #7.	15.4799	144.50763	3913	12	Leaning Tower	Tunncliffe
S47-Geo-08	2016-12-16	09:14:33	S47-geo-08 Rock from where all the other samples were just taken. Near the snails. There were shrimp on the rock and eggs (the shrimp left). In forward-stbd quarter of the stbd biobox.	15.4799	144.50763	3913	13	Leaning Tower	Tunncliffe
S47-GTB-09	2016-12-16	10:57:13	S47-GTB-09 Fired. Probe was down the hole at Stump of Mystery. Red Gastight #9. Taken from the top of the chimney in a hole that was excavated. High temp after all HFS samples was 265.7degC.	15.4802	144.50772	3907	313	Stump of Mystery	Lupton
S47-HFS-10	2016-12-16	11:12:16	S47-HFS-10 Start 11:12. Unfiltered Piston #8. Stop 11:16. Tmax=221.8 Tavg=218 vol=629 T2=57. Can see exhaust. Good one.	15.4802	144.50772	3907	313	Stump of Mystery	Butterfield
S47-HFS-11	2016-12-16	11:17:11	S47-HFS-11 Start 11:17. Filtered Piston #7. Stop 11:21. Tmax=224.3 Tavg=217 vol=700 T2=55. Can see exhaust. Same exact location as HFS-10 at Stump of Mystery.	15.4802	144.50772	3907	313	Stump of Mystery	Butterfield
S47-HFS-12	2016-12-16	11:22:15	S47-HFS-12 Start 11:22. Unfiltered Piston #6 at same exact location on Stump of Mystery. Stop 11:26. Tmax=240.9 Tavg=233.4 vol=677 T2=58.	15.4802	144.50772	3907	313	Stump of Mystery	Butterfield

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S47-Geo-13	2016-12-16	11:49:03	S47-Geo-13 Sample of chimneys at the top of the chimney including the one sampled for water and gas.	15.4802	144.50772	3906	313	Stump of Mystery	Berkenbosch
S47-Bio-14	2016-12-16	12:04:53	S47-Bio-14 Suction of sulfide worms from top of the chimney where the other samples came from. Into Jar #4.	15.4802	144.50772	3906	313	Stump of Mystery	Tunncliffe
S47-HFS-15	2016-12-16	12:23:50	S47-HFS-15. Unfiltered Bag #18. Start 12:25. Stop 12:27. Tmax= 16.4, ave= 15.3, vol= 403, T2= 6.5 In clump of snails on Stump of Mystery where sensor reading #3 taken.	15.4802	144.50772	3909	318	Stump of Mystery	Butterfield
S47-HFS-16	2016-12-16	12:42:20	S47-HFS-16. Filtered bag #19. Stop 12:44. Tmax= 73.3, ave= 69.6, vol= 400, T2= 19. Same location as reading #5.	15.4802	144.50772	3909	321	Stump of Mystery	Butterfield
S47-Bio-17	2016-12-16	12:56:01	S47-Bio-17 Suctioning snails (some shrimp as well) into Jar #6 at Stump of Mystery. Same location as sensor reading #3 and S47-HFS-15.	15.4802	144.50772	3909	323	Stump of Mystery	Tunncliffe
S47-Bio-18	2016-12-16	12:58:31	S47-Bio-18 Suctioning sulfide worms (and some snails) at the same location as reading #4. Into Jar #5.	15.4802	144.50772	3909	323	Stump of Mystery	Tunncliffe
S47-Geo-19	2016-12-16	13:06:12	S47-Geo-19 Orange piece of Stump of Mystery. Hoping there is some animals on it. Into rear port bio box, rear stbd partition.	15.4802	144.50772	3909	324	Stump of Mystery	Tunncliffe
S47-Bio-20	2016-12-16	13:10:00	S47-Bio-20 SPME #1. Solid phase extractor puck: control sample held for 10 min on ascent.	15.4802	144.50772	3909	326	Stump of Mystery	Tunncliffe

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
Dive S48 - Perseverance									
S48-Geo-01	2016-12-16	22:38:49	S48-Geo-01 Bud of pillow lava near the bottom of the slope of the pillow mound after turning north from Palisades. Sampling was difficult due to the crumbly nature of these pillows.	15.48000	144.50789	3909	28	Pillow mound north of Perseverance	Chadwick
Dive S49 - Perseverance									
S49-HFS-01	2016-12-18	00:29:30	S49-HFS-01. Start 00:29 RNA Filter #11 Background water sample after almost reaching the bottom and dive being canceled. Sample ended on its own while ascending 02:55. 27 minutes to fill. Tmax=1.2 Tavg=1.1 vol=3001.	15.48008	144.50735	3664	53	Background water	Huber
S49-HFS-02	2016-12-18	01:09:25	S49-HFS-02 Unfiltered Bag #16. Another background water sample while ascending. Stop 01:11. Tmax=1.3 Tavg=1.2 vol=401 ml	15.47946	144.50697	2558	263	Background water	Butterfield
S49-HFS-03	2016-12-18	01:12:59	S49-HFS-03 01:12 Background water sample. pH values seem to be low today and probably need to recalibrate. pH=7.15 in the deep water (had been 7.5).	15.47946	144.50697	2433	262	Background water	Butterfield
S49-GTB-04	2016-12-18	03:08:55	S49-GTB-04 Fired. ~03:06 Fired when chimney broke/ram bent. This was fired before the view of the bent ram. Saw the tip go into the chimney (not further into the hold) when fired. Questions raised if it actually fired so not logged at the time as a sample.	15.4802	144.50772	3907	317	Stump of Mystery	Lupton

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S49-Bio-05	2016-12-18	03:42:35	S49-Bio-05 Suctioning into Jar #2 from the cracks in the seafloor near the base of Leaning Tower. White cracks with floc coming out but aiming for sediment. Limpets and scaleworm.	15.4799	144.50754	3914	137	Limpet Canyon	Tunncliffe
S49-Bio-06	2016-12-18	03:49:01	S49-Bio-06 Suction along the surface of the orange rock next to the white crack sampled on bio-05. Into Jar #3.	15.4799	144.50754	3914	139	Limpet Canyon	Tunncliffe
S49-HFS-07	2016-12-18	04:19:38	S49-HFS-07 Start 04:19 Unfiltered Bag #18 Stop 04:22 Tmax=20.8 Tavg=19.0 vol=400 T2=8.8 Taken from diffuse flow with limpets and shrimp near the base of Leaning Tower in crack with shimmer.	15.4799	144.50754	3913	41	Limpet Canyon	Butterfield
S49-HFS-08	2016-12-18	04:22:44	S49-HFS-08 Start 04:22 Unfiltered Bag #18 Stop 04:25 Tmax=21.0 Tavg=19.0 vol=400 T2=9 At the same location as last sample at Limpet's Canyon.	15.4799	144.50754	3913	41	Limpet Canyon	Butterfield
S49-HFS-09	2016-12-18	04:26:04	S49-HFS-09 Start 04:26 LVB #24 At same location. No flow/bad sample-aborted.	15.4799	144.50754	3913	41	Limpet Canyon	Huber
S49-HFS-10	2016-12-18	04:30:38	S49-HFS-10. RNA filter #10. Same location as previous sample. Stop 04:56 Tmax=21 Tavg=17.7 T2=8 vol=2997 ml. Seeing flow this time.	15.4799	144.50754	3913	41	Limpet Canyon	Huber
S49-HFS-11	2016-12-18	04:57:45	S49-HFS-11 Start Unfiltered Bag #20 Stop 05:00 Tmax=19.3 Tavg=18.3 T2=8.7 vol=420 ml. At the same location at Limpet Canyon after the RNA filter.	15.4799	144.50754	3913	44	Limpet Canyon	Huber

Sample	Date	time	Observation	Latitude	Longitude	Depth	Heading	Location	PI
S49-HFS-12	2016-12-18	05:18:24	S49-HFS-12 Start 05:18 Filtered Piston #3 Taken at the top of Stump of Mystery but not in the hottest water. Not working Aborted.	15.4802	144.50772	3906	346	Stump of Mystery	Butterfield
S49-HFS-13	2016-12-18	05:19:50	S49-HFS-13 Start 05:19. Unfiltered Piston #4. Stop 05:22 Tmax=44.7 Tavg=38.3 vol=500 T2=15. Can see exhaust. Good example at the top but not hottest water at Stump.	15.4802	144.50772	3906	346	Stump of Mystery	Butterfield

Table 6.5-2 Sample images

Sample	Image	Dive Site	Location	PI
Dive S34 - Daikoku				
S34-HFS-01	S5K06541.jpg	Daikoku	10m East of Okeanos Fish Spa	Butterfield
S34-Bio-02	S5K07711.jpg	Daikoku	10m East of Okeanos Fish Spa	Tunncliffe
S34-Bio-03	S5K08913.jpg	Daikoku	10m East of Okeanos Fish Spa	Tunncliffe
S34-HFS-04	S5K11725.jpg	Daikoku	10m East of Okeanos Fish Spa	Butterfield
S34-HFS-05	S5K12034.jpg	Daikoku	10m East of Okeanos Fish Spa	Butterfield
S34-HFS-06	S5K12743.jpg	Daikoku	10m East of Okeanos Fish Spa	Huber
S34-Geo-07	S5K14666.jpg	Daikoku	10m East of Okeanos Fish Spa	Berkenbosch
S34-Geo-08	S5K15855.jpg	Daikoku	10m East of Okeanos Fish Spa	Berkenbosch
S34-Bio-11A	S5K17065.jpg	Daikoku	Mkr-132 FK-2016 Fish Spa	Tunncliffe
S34-Bio-09	S5K17507.jpg	Daikoku	Mkr-132 FK-2016 Fish Spa	Tunncliffe
S34-Geo-10	S5K20690.jpg	Daikoku	Mkr-132 FK-2016 Fish Spa	Berkenbosch
S34-Bio-11B	S5K22587.jpg	Daikoku	downhill of Mkr-132 (FK-2016 Fish Spa)	Tunncliffe
S34-Bio-11C	S5K23259.jpg	Daikoku	25m E of waypoint 2 (Sulfur pond)	Tunncliffe
S34-Geo-12	(no image taken)	Daikoku	Over sulfur pond	Berkenbosch
Dive S35 - Daikoku				
S35-HFS-01	S5K06163.jpg	Daikoku	6m EofN Fish Spa	Butterfield
S35-HFS-02	S5K06623.jpg	Daikoku	6m EofN Okeanos Fish Spa	Butterfield
S35-HFS-03	S5K06914.jpg	Daikoku	6m EofN Okeanos Fish Spa	Huber
S35-HFS-04	S5K08131.jpg	Daikoku	6m EofN Okeanos Fish Spa	Butterfield
S35-HFS-05	S5K08537.jpg	Daikoku	6m EofN Okeanos Fish Spa	Butterfield
S35-HFS-06	S5K09523.jpg	Daikoku	6m EofN Okeanos Fish Spa	Butterfield
S35-HFS-07	S5K14009.jpg	Daikoku	Mkr-133	Butterfield
S35-HFS-08	S5K14260.jpg	Daikoku	Mkr-133	Butterfield
S35-Bio-09	S5K15549.jpg	Daikoku	Mkr-133	Tunncliffe

Sample	Image	Dive Site	Location	PI
S35-Bio-10	S5K19574.jpg	Daikoku	20m E/5mN WP2 crater rim inside wall	Tunncliffe
S35-HFS-11	S5K20381.jpg	Daikoku	20m E/5mN WP2	Butterfield
S35-Bio-12	S5K25423.jpg	Daikoku	Mkr-137	Tunncliffe
S35-HFS-13	S5K30170.jpg	Daikoku	Okeanos Fish Spa	Butterfield
S35-HFS-14	S5K30427.jpg	Daikoku	Okeanos Fish Spa	Butterfield
S35-HFS-15	S5K30748.jpg	Daikoku	Okeanos Fish Spa	Huber
S35-HFS-16	S5K31794.jpg	Daikoku	Okeanos Fish Spa	Huber
S35-Bio-17	S5K33980.jpg	Daikoku	8m S of Okeanos Fish Spa	Tunncliffe
S35-Bio-18	S5K35379.jpg	Daikoku	10m SE Okeanos Fish Spa	Tunncliffe

Dive S36 - Chamorro

S36-Geo-01	2016-12-04T00_30_18.839543_S5K.jpg	Chamorro	Waypoint 1	Berkenbosch
S36-HFS-02	S5K02434.jpg	Chamorro	Waypoint 1	Butterfield
S36-HFS-03	2016-12-04T00_47_42.852709_S5K.jpg	Chamorro	Waypoint 1	Butterfield
S36-HFS-04	S5K02791.jpg	Chamorro	Waypoint 1	Butterfield
S36-HFS-05	2016-12-04T00_53_19.842745_S5K.jpg	Chamorro	Waypoint 1	Butterfield

Dive S37 - Illium

S37-Geo-01	2016-12-05T01_10_19.200984_S5K.jpg	Illium	Old Chimney	Berkenbosch
S37-HFS-02	S5K21119.jpg	Illium	Snail Pile Mkr-138	Butterfield
S37-HFS-03	2016-12-05T02_19_20.244787_S5K.jpg	Illium	Snail Pile Mkr-138	Butterfield
S37-HFS-04	2016-12-05T02_30_45.270230_S5K.jpg	Illium	Snail Pile Mkr-138	Butterfield
S37-HFS-05	2016-12-05T02_34_48.254938_S5K.jpg	Illium	Snail Pile Mkr-138	Butterfield
S37-HFS-06	2016-12-05T02_39_14.254246_S5K.jpg	Illium	Snail Pile Mkr-138	Huber
S37-HFS-07	2016-12-05T03_06_52.282143_S5K.jpg	Illium	Snail Pile Mkr-138	Butterfield
S37-HFS-08	2016-12-05T03_14_28.303870_S5K.jpg	Illium	Snail Pile Mkr-138	Huber
S37-HFS-09	2016-12-05T03_29_04.318531_S5K.jpg	Illium	Snail Pile Mkr-138	Butterfield
S37-Bio-10	S5K27093.jpg	Illium	Snail Pile Mkr-138	Tunncliffe
S37-HFS-11	2016-12-05T03_58_05.329973_S5K.jpg	Illium	Snail Pile Mkr-138	Butterfield

Sample	Image	Dive Site	Location	PI
S37-HFS-12	S5K27521.jpg	Illium	Snail Pile Mkr-138	Butterfield
S37-Bio-13	2016-12-05T04_03_57.321675_S5K.jpg	Illium	Snail Pile Mkr-138	Tunncliffe
S37-Bio-14	2016-12-05T04_08_10.344472_S5K.jpg	Illium	Snail Pile Mkr-138	Tunncliffe
S37-HFS-15	2016-12-05T04_12_14.358400_S5K.jpg	Illium	Snail Pile Mkr-138	Butterfield

Dive S39 - Alice Springs

S39-HFS-01	1480995610562S5K14955.jpg	Alice Springs	Diffuse site 22m NE of old Alice Springs	Butterfield
S39-HFS-02	S5K17643.jpg	Alice Springs	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-03	S5K17974.jpg	Alice Springs	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-04	2016-12-06T04_39_59.192988_S5K.jpg	Alice Springs	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-05	2016-12-06T04_39_59.192988_S5K.jpg	Alice Springs	Mkr-131 Snail-001 Site	Butterfield
S39-GTB-06	2016-12-06T05_14_07.230523_S5K.jpg	Alice Springs	Mkr-131 Snail-001 Site	Lupton
S39-HFS-07	2016-12-06T06_11_19.280853_S5K.jpg	Alice Springs	Mkr-131 Snail-001 Site	Huber
S39-HFS-08	S5K25603.jpg	Alice Springs	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-09	S5K25956.jpg	Alice Springs	Mkr-131 Snail-001 Site	Butterfield
S39-HFS-10	S5K26301.jpg	Alice Springs	Mkr-131 Snail-001 Site	Huber
S39-Geo-11	2016-12-06T07_24_20.338705_S5K.jpg	Alice Springs	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-12	2016-12-06T07_27_44.339526_S5K.jpg	Alice Springs	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-13	S5K29127.jpg	Alice Springs	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-14	2016-12-06T07_52_10.330046_S5K.jpg	Alice Springs	Mkr-131 Snail-001 Site	Tunncliffe
S39-Bio-15	S5K34511.jpg	Alice Springs	Little Anemones	Tunncliffe
S39-HFS-16	none taken	background	900m background	Butterfield

Dive S40 - Burke

S40-Bio-01	2016-12-07T01_41_53.934807_S5K.jpg	Burke	Snail Pit Mkr-234	Tunncliffe
S40-Bio-02	1481075410362S5K17273.jpg	Burke	Snail Pit Mkr-234	Tunncliffe
S40-Bio-03	2016-12-07T01_59_51.943283_S5K.jpg	Burke	Snail Pit Mkr-234	Tunncliffe
S40-Geo-04	2016-12-07T02_07_57.922797_S5K.jpg	Burke	Snail Pit Mkr-234	Tunncliffe
S40-HFS-05	2016-12-07T02_38_57.931242_S5K.jpg	Burke	Snail Pit Mkr-234	Butterfield

Sample	Image	Dive Site	Location	PI
S40-HFS-06	2016-12-07T02_43_08.912108_S5K.jpg	Burke	Snail Pit Mkr-234	Butterfield
S40-HFS-07	2016-12-07T02_49_21.919110_S5K.jpg	Burke	Snail Pit Mkr-234	Butterfield
S40-HFS-08	2016-12-07T02_53_04.947180_S5K.jpg	Burke	Snail Pit Mkr-234	Butterfield
S40-HFS-09	2016-12-07T02_59_35.922594_S5K.jpg	Burke	Snail Pit Mkr-234	Huber
S40-HFS-10	1481081051099S5K22914.jpg	Burke	Snail Pit Mkr-234	Huber
S40-HFS-11	1481082855176S5K24718.jpg	Burke	Snail Pit Mkr-234	Butterfield
S40-Bio-12	2016-12-07T04_05_48.960604_S5K.jpg	Burke	Snail Pit Mkr-234	Bates
S40-Bio-13	1481083688449S5K25551.jpg	Burke	Snail Pit Mkr-234	Bates
S40-HFS-14	1481084807132S5K26670.jpg	Burke	Milky Flow	Butterfield
S40-HFS-15	2016-12-07T04_30_04.953892_S5K.jpg	Burke	Milky Flow	Butterfield

Dive S41 - Hafa Adai

S41-Geo-01	S5K11893.jpg	Hafa Adai	Two Towers	Berkenbosch
S41-GTB-02	2016-12-08T02_19_58.526742_S5K.jpg	Hafa Adai	Sequoia	Lupton
S41-Bio-03	2016-12-08T02_34_28.587850_S5K.jpg	Hafa Adai	Sequoia	Tunncliffe
S41-Bio-04	S5K22839.jpg	Hafa Adai	Sequoia	Tunncliffe
S41-Bio-05	2016-12-08T03_01_24.593236_S5K.jpg	Hafa Adai	Sequoia	Tunncliffe
S41-HFS-06	2016-12-08T03_28_37.604368_S5K.jpg	Hafa Adai	Sequoia	Butterfield
S41-HFS-07	2016-12-08T03_34_43.611372_S5K.jpg	Hafa Adai	Sequoia	Butterfield
S41-Geo-08	S5K26093.jpg	Hafa Adai	Sequoia	Berkenbosch
S41-Geo-09	S5K27140.jpg	Hafa Adai	Sequoia	Berkenbosch
S41-Bio-10	2016-12-08T07_16_20.703918_S5K.jpg	Hafa Adai	Waypoint 7	Tunncliffe
S41-Geo-11	2016-12-08T07_21_54.706742_S5K.jpg	Hafa Adai	Waypoint 7	Berkenbosch

Dive S42 - Hafa Adai

S42-HFS-01	2016-12-08T23_40_32.762757_S5K.jpg	Hafa Adai	Hula array	Butterfield
S42-HFS-02	2016-12-08T23_44_17.786454_S5K.jpg	Hafa Adai	Hula array	Butterfield
S42-HFS-03	2016-12-09T00_19_06.811418_S5K.jpg	Hafa Adai	Hula array	Butterfield
S42-HFS-04	1481243066915S5K12519.jpg	Hafa Adai	Hula array	Butterfield

Sample	Image	Dive Site	Location	PI
S42-HFS-05	2016-12-09T00_31_53.811769_S5K.jpg	Hafa Adai	Hula array	Huber
S42-HFS-06	2016-12-09T01_00_01.837003_S5K.jpg	Hafa Adai	Hula array	Huber
S42-HFS-07	2016-12-09T01_36_57.848762_S5K.jpg	Hafa Adai	Hula array	Butterfield
S42-HFS-08	2016-12-09T01_39_51.858412_S5K.jpg	Hafa Adai	Hula array	Butterfield
S42-Bio-09	2016-12-09T02_18_00.887841_S5K.jpg	Hafa Adai	Snail Graveyard	Tunncliffe
S42-Bio-10	2016-12-09T02_40_25.910729_S5K.jpg	Hafa Adai	Snail Graveyard	Tunncliffe
S42-Bio-11	1481251347111S5K20799.jpg	Hafa Adai	Snail Graveyard	Tunncliffe
S42-Geo-12	1481252040103S5K21492.jpg	Hafa Adai	Rim above graveyard	Tunncliffe
S42-Geo-13	2016-12-09T03_17_20.937736_S5K.jpg	Hafa Adai	outside wall NE Voodoo	Berkenbosch
S42-Geo-14	2016-12-09T03_34_29.929175_S5K.jpg	Hafa Adai	sheet flow west of Voodoo	Berkenbosch
S42-HFS-15	1481256577254S5K26029.jpg	Hafa Adai	NE Sequoia 25m up	Butterfield
S42-HFS-16	1481256912244S5K26364.jpg	Hafa Adai	NE Sequoia 25m up	Butterfield
S42-HFS-17	2016-12-09T04_38_55.943271_S5K.jpg	Hafa Adai	NE Sequoia 25m up	Butterfield
S42-HFS-18	2016-12-09T04_45_28.968238_S5K.jpg	Hafa Adai	NE Sequoia 25m up	Butterfield
S42-HFS-19	2016-12-09T04_51_48.948333_S5K.jpg	Hafa Adai	NE Sequoia 25m up	Butterfield
S42-Geo-20	1481259904215S5K29356.jpg	Hafa Adai	NE Sequoia 25m up	Berkenbosch
S42-GTB-21	2016-12-09T05_58_59.019020_S5K.jpg	Hafa Adai	NE Sequoia 25m up	Lupton
S42-Geo-22	2016-12-09T06_42_18.075084_S5K.jpg	Hafa Adai	Sequoia base	Berkenbosch
S42-Geo-23	2016-12-09T07_35_05.105609_S5K.jpg	Hafa Adai	Chimney at WP-08	Berkenbosch

Dive S43 - Hafa Adai

S43-Geo-01	1481325669508S5K10309.jpg	Hafa Adai	West of Breached Cone	Chadwick
S43-Geo-02	S5K16339.jpg	Hafa Adai	South of Breached Cone	Berkenbosch
S43-HFS-03	2016-12-10T02_04_27.562454_S5K.jpg	Hafa Adai	Alba Vent	Butterfield
S43-HFS-04	2016-12-10T02_45_28.568287_S5K.jpg	Hafa Adai	Alba Vent	Butterfield
S43-HFS-05	2016-12-10T02_53_32.546326_S5K.jpg	Hafa Adai	Alba Vent	Butterfield
S43-HFS-06	2016-12-10T03_04_55.559459_S5K.jpg	Hafa Adai	Alba Vent	Butterfield
S43-GTB-07	1481342489809S5K27129.jpg	Hafa Adai	Alba Vent	Lupton

Sample	Image	Dive Site	Location	PI
S43-Geo-08	S5K28287.jpg	Hafa Adai	Alba Vent	Berkenbosch
S43-HFS-09	S5K28889.jpg	Hafa Adai	Alba Vent	Huber
S43-HFS-10	S5K30330.jpg	Hafa Adai	Alba Vent	Huber
S43-HFS-11	2016-12-10T05_24_48.630237_S5K.jpg	Hafa Adai	Alba Vent	Butterfield
S43-HFS-12	2016-12-10T05_28_11.616844_S5K.jpg	Hafa Adai	Alba Vent	Butterfield
S43-HFS-13	2016-12-10T05_31_40.637732_S5K.jpg	Hafa Adai	Alba Vent	Butterfield
S43-Bio-14	2016-12-10T06_17_59.669205_S5K.jpg	Hafa Adai	Alba Vent	Tunncliffe

Dive S44 - Hafa Adai

S44-Geo-01	2016-12-11T01_36_13.698353_S5K.jpg	Hafa Adai	south of Mami Wata	Chadwick
S44-HFS-02	S5K10187.jpg	Hafa Adai	Mami Wata	Butterfield
S44-HFS-03	1481428477805S5K16487.jpg	Hafa Adai	Two Towers	Butterfield
S44-HFS-04	2016-12-11T04_05_16.786259_S5K.jpg	Hafa Adai	Two Towers	Butterfield
S44-HFS-05	2016-12-11T04_11_14.778411_S5K.jpg	Hafa Adai	Two Towers	Butterfield
S44-GTB-06	2016-12-11T04_23_39.797330_S5K.jpg	Hafa Adai	Two Towers	Lupton
S44-Geo-07	2016-12-11T04_37_00.807459_S5K.jpg	Hafa Adai	Two Towers	Berkenbosch
S44-Geo-08	2016-12-11T05_11_45.849272_S5K.jpg	Hafa Adai	Outside Voodoo Crater	Berkenbosch
S44-HFS-09	1481434917399S5K22926.jpg	Hafa Adai	Hula array	Butterfield
S44-HFS-10	2016-12-11T05_45_21.870903_S5K.jpg	Hafa Adai	Hula array	Butterfield
S44-HFS-11	2016-12-11T05_52_34.878645_S5K.jpg	Hafa Adai	Hula array	Butterfield
S44-HFS-12	1481435869056S5K23878.jpg	Hafa Adai	Hula array	Huber
S44-HFS-13	2016-12-11T06_22_20.903567_S5K.jpg	Hafa Adai	Hula array	Huber
S44-HFS-14	2016-12-11T06_48_59.936849_S5K.jpg	Hafa Adai	Hula array	Butterfield
S44-Bio-15	2016-12-11T07_30_42.949903_S5K.jpg	Hafa Adai	Hula array	Tunncliffe
S44-Bio-16	1481441758045S5K29767.jpg	Hafa Adai	Hula array	Tunncliffe
S44-HFS-17	1481442496969S5K30506.jpg	Hafa Adai	Hula array	Butterfield
S44-HFS-18	2016-12-11T07_55_44.962406_S5K.jpg	Hafa Adai	Hula array	Butterfield
S44-HFS-19	1481443209256S5K31218.jpg	Hafa Adai	Hula array	Butterfield

Sample	Image	Dive Site	Location	PI
S44-HFS-20	(none taken)		Background water	Butterfield

Dive S45 - New Lava

S45-Geo-01	1481506591039S5K10002.jpg	New Lava Flow	10m W of WP-01	Chadwick
S45-Geo-02	2016-12-12T02_02_51.561504_S5K.jpg	New Lava Flow	60m S of WP-01	Chadwick
S45-Geo-03	2016-12-12T02_49_21.581462_S5K.jpg	New Lava Flow	between WP-02 & WP-03	Chadwick
S45-Geo-04	S5K18014.jpg	New Lava Flow	near WP-05	Chadwick
S45-Geo-05	S5K19145.jpg	New Lava Flow	10m SW of WP-06	Chadwick
S45-Geo-06	S5K21883.jpg	New Lava Flow	125m W of WP-07	Chadwick

Dive S47 - Perseverance

S47-HFS-01	2016-12-16T07_39_10.195319_S5K.jpg	Perseverance	Leaning Tower	Butterfield
S47-HFS-02	2016-12-16T07_43_19.183971_S5K.jpg	Perseverance	Leaning Tower	Butterfield
S47-HFS-03	2016-12-16T07_50_22.212362_S5K.jpg	Perseverance	Leaning Tower	Butterfield
S47-HFS-04	1481874804655S5K17461.jpg	Perseverance	Leaning Tower	Butterfield
S47-HFS-05	2016-12-16T08_07_32.221912_S5K.jpg	Perseverance	Leaning Tower	Huber
S47-HFS-06	2016-12-16T08_32_01.230829_S5K.jpg	Perseverance	Leaning Tower	Huber
S47-Bio-07	1481879311504S5K21968.jpg	Perseverance	Leaning Tower	Tunncliffe
S47-Geo-08	2016-12-16T09_14_33.286271_S5K.jpg	Perseverance	Leaning Tower	Tunncliffe
S47-GTB-09	2016-12-16T10_57_12.305104_S5K.jpg	Perseverance	Stump of Mystery	Lupton
S47-HFS-10	1481886735450S5K29392.jpg	Perseverance	Stump of Mystery	Butterfield
S47-HFS-11	1481887030569S5K29687.jpg	Perseverance	Stump of Mystery	Butterfield
S47-HFS-12	1481887335371S5K29992.jpg	Perseverance	Stump of Mystery	Butterfield
S47-Geo-13	2016-12-16T11_49_03.331575_S5K.jpg	Perseverance	Stump of Mystery	Berkenbosch
S47-Bio-14	2016-12-16T12_04_52.368689_S5K.jpg	Perseverance	Stump of Mystery	Tunncliffe
S47-HFS-15	2016-12-16T12_23_49.381350_S5K.jpg	Perseverance	Stump of Mystery	Butterfield
S47-HFS-16	2016-12-16T12_42_20.406529_S5K.jpg	Perseverance	Stump of Mystery	Butterfield
S47-Bio-17	2016-12-16T12_56_00.382107_S5K.jpg	Perseverance	Stump of Mystery	Tunncliffe
S47-Bio-18	2016-12-16T12_58_31.406495_S5K.jpg	Perseverance	Stump of Mystery	Tunncliffe

Sample	Image	Dive Site	Location	PI
S47-Geo-19	2016-12-16T13_06_12.409190_S5K.jpg	Perseverance	Stump of Mystery	Tunncliffe
S47-Bio-20	1481893799599S5K36456.jpg	Perseverance	Stump of Mystery	Tunncliffe

Dive S48 - Perseverance

S48-Geo-01	2016-12-16T22_38_06.074122_S5K.jpg	Perseverance	Pillow mound north of Perseverance	Chadwick
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Dive S49 - Perseverance

S49-HFS-01	none taken	Perseverance	Background water	Huber
S49-HFS-02	none taken	Perseverance	Background water	Butterfield
S49-HFS-03	none taken	Perseverance	Background water	Butterfield
S49-GTB-04	2016-12-18T03_08_46.571937_S5K.jpg	Perseverance	Stump of Mystery	Lupton
S49-Bio-05	2016-12-18T03_42_34.643035_S5K.jpg	Perseverance	Limpet Canyon	Tunncliffe
S49-Bio-06	2016-12-18T03_49_00.614695_S5K.jpg	Perseverance	Limpet Canyon	Tunncliffe
S49-HFS-07	2016-12-18T04_19_37.628871_S5K.jpg	Perseverance	Limpet Canyon	Butterfield
S49-HFS-08	1482034963911S5K24835.jpg	Perseverance	Limpet Canyon	Butterfield
S49-HFS-09	2016-12-18T04_28_30.616671_S5K.jpg	Perseverance	Limpet Canyon	Huber
S49-HFS-10	1482035437819S5K25309.jpg	Perseverance	Limpet Canyon	Huber
S49-HFS-11	2016-12-18T04_57_44.644985_S5K.jpg	Perseverance	Limpet Canyon	Huber
S49-HFS-12	1482038136809S5K28008.jpg	Perseverance	Stump of Mystery	Butterfield
S49-HFS-13	2016-12-18T05_19_49.648406_S5K.jpg	Perseverance	Stump of Mystery	Butterfield

6.6 SuBastian Dive logs

Note: Positions in these tables are unedited so include bad navigation when stationary while sampling.

Table 6.6-1 Dive S34 – Daikoku

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-1	21:39	We are approximately 10m from the target of waypoint 1. We are seeing a lot of bubbles.	21.32513	144.19166	351	265	1480628352656S5K02515.jpg
2016-12-1	21:42	Can see bottom in cameras with a lot of smoke. Front port corner captured bottom first.	21.32513	144.19166	389	257	1480628537781S5K02700.jpg
2016-12-1	21:43	Seeing smoke and a lot of white sulfur coating. Individual smoker visible.	21.32511	144.19166	399	232	1480628620747S5K02783.jpg
2016-12-1	21:44	Nice view of smoker with some yellow visible.	21.32511	144.19166	402	226	1480628698726S5K02861.jpg
2016-12-1	21:45	Fish are swimming in the pilot camera.	21.32509	144.19166	402	175	
2016-12-1	21:46	We are still approximately 10m from the target. Taking a view around the area.	21.32515	144.19165	405	261	1480628813742S5K02976.jpg
2016-12-1	21:47	Highlights on while panning around the area.	21.32516	144.19166	407	205	S5K03031.jpg
2016-12-1	21:48	Significant sulfur crust substrate. Fish on the bottom.	21.32514	144.19168	409	230	S5K03073.jpg
2016-12-1	21:50	Fish close-up.	21.32513	144.19168	409	202	S5K03180.jpg
2016-12-1	21:51	Currently adjusting cameras and viewing around the area. There are fish!	21.32513	144.19171	409	245	S5K03273.jpg
2016-12-1	21:52	Going to land here and get a temperature of the area.	21.32513	144.19171	409	241	S5K03300.jpg
2016-12-1	21:52	Looks like crust with sediment underneath.	21.32513	144.19172	408	243	S5K03341.jpg
2016-12-1	21:53	Want to see the difference between the crusty-looking substrate and the rougher material to the left in the camera view.	21.32511	144.19169	408	210	S5K03394.jpg
2016-12-1	21:55	Background pH is 8.28 for a reference. Water temp is 13.2.	21.32510	144.19167	407	139	S5K03494.jpg
2016-12-1	21:57	Background ROV temp is 13.48.	21.32509	144.19166	407	144	S5K03588.jpg
2016-12-1	21:58	Getting ready to land between the two substrates.	21.32509	144.19167	408	148	S5K03643.jpg
2016-12-1	21:59	Preparing to take temperature.	21.32509	144.19167	410	146	S5K03747.jpg
2016-12-1	22:00	Taking temperature near the fish in the soft sediment.	21.32509	144.19167	410	145	S5K03797.jpg
2016-12-1	22:01	Temperature doesn't seem to be any warmer than ambient.	21.32509	144.19167	410	145	S5K03863.jpg
2016-12-1	22:02	Moved to the white-coated substrate which turns out to be soft sediment as well. Temperature here is higher 16.11deg. It is probably microbial mat growing here.	21.32509	144.19167	410	144	S5K03915.jpg
2016-12-1	22:03	The rougher material was ambient and this white-coated area had a high temp of 16.26deg. No difference in the number of fish.	21.32509	144.19167	410	144	S5K03985.jpg
2016-12-1	22:04	Going to take another temperature to the far right (as ROV can reach). Going to place probe always down to where the bend of probe is.	21.32509	144.19167	410	144	S5K04035.jpg
2016-12-1	22:05	Warmer going left to right with a high of 22.56deg.	21.32509	144.19167	410	145	S5K04097.jpg
2016-12-1	22:09	Plenty of fish here.	21.32509	144.19167	410	163	S5K04307.jpg
2016-12-1	22:09	Picked up probe and moving a bit toward the right.	21.32509	144.19167	409	171	S5K04340.jpg
2016-12-1	22:10	Lots of fish on soft sediment covered with microbial mat and some sulfur. Sediment temperature is 5-6 degrees above ambient temperature.	21.32509	144.19167	410	179	S5K04380.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-1	22:11	The white material is behaving like crust or mat so could be elemental sulfur.	21.32509	144.19168	410	196	S5K04423.jpg
2016-12-1	22:11	Moved to the right about 1.5-2m to take another temperature of sediments.	21.32509	144.19168	410	197	S5K04467.jpg
2016-12-1	22:12	Temperature is rising more as we moved further to the right. At least 10deg warmer.	21.32509	144.19168	410	197	S5K04491.jpg
2016-12-1	22:13	Temperature at 23.73. Seeing long strings of sulfur.	21.32509	144.19168	410	197	S5K04569.jpg
2016-12-1	22:13	Strings are probably sulfur. Close-up of the sediment. See little balls that are not limpets or snail. Look like sulfur bombs with tails on the balls.	21.32509	144.19168	410	197	S5K04600.jpg
2016-12-1	22:15	Capture_0001 is the new high def file. Highlights are off.	21.32509	144.19169	410	197	S5K04689.jpg
2016-12-1	22:16	Temperature over 24deg. Lasers are difficult to see on the display.	21.32509	144.19168	410	197	S5K04727.jpg
2016-12-1	22:17	Done with the temperature probe. Lasers are 10cm apart and appear as faint green dots.	21.32510	144.19168	410	197	S5K04806.jpg
2016-12-1	22:18	Stowing the temperature probe.	21.32510	144.19168	410	197	
2016-12-1	22:20	Near the magmatic vent which bubbles were seen with the ship's sonar. Soft sediment covered with flatfish and elemental sulfur. Sediment was 10deg above ambient temperature.	21.32509	144.19168	410	197	
2016-12-1	22:22	Preparing to take measurements of pH with the Beast at the same location.	21.32510	144.19168	410	193	S5K05139.jpg
2016-12-1	22:24	Grabbing the HFS intake.	21.32510	144.19168	410	193	S5K05242.jpg
2016-12-1	22:26	Taking HFS measurement at the same location as the last temperature measurement.	21.32510	144.19168	410	193	S5K05329.jpg
2016-12-1	22:26	Bringing up the Beast.	21.32510	144.19168	410	193	
2016-12-1	22:26	Tip of wand is just above the sediment.	21.32510	144.19168	410	193	
2016-12-1	22:27	<i>Symphurus themophilus</i> "Tongue Fish" is the fish we are observing here.	21.32510	144.19168	410	193	S5K05413.jpg
2016-12-1	22:28	HFS sensor reading: pH is dropping and temperature is 13.6.	21.32510	144.19168	410	193	S5K05492.jpg
2016-12-1	22:29	pH dropped and then came back up.	21.32510	144.19169	410	194	S5K05557.jpg
2016-12-1	22:30	Stopping HFS pump as wand entered the sediment. Will take another series of readings.	21.32510	144.19169	410	194	S5K05597.jpg
2016-12-1	22:31	Position of wand is locked in place above sediment. Turning HFS on.	21.32510	144.19169	410	194	S5K05645.jpg
2016-12-1	22:31	Fish are abundant around the HFS intake while taking the measurements. pH dropped to 7 from a background of ph. of 8.	21.32510	144.19169	410	194	S5K05680.jpg
2016-12-1	22:34	Low of pH of 6! Probably occurred when took in some sediment with the water.	21.32509	144.19169	410	195	S5K05854.jpg
2016-12-1	22:35	Stopped the flush pump and running smaller pump to see if pH changes.	21.32509	144.19170	410	195	S5K05912.jpg
2016-12-1	22:36	That setting probably wasn't enough flow. Turning on pump on a lower setting.	21.32509	144.19170	410	195	
2016-12-1	22:37	No obvious flow but warm water is seeping from below since temperature is 10deg above ambient just 10cm down in the sediment.	21.32509	144.19170	410	195	S5K05989.jpg
2016-12-1	22:38	Stopped flush pump and going to take a sample nearby.	21.32509	144.19170	410	195	S5K06066.jpg
2016-12-1	22:39	Great position.	21.32509	144.19170	410	195	S5K06109.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-1	22:39	Turning pump on.	21.32509	144.19170	410	195	
2016-12-1	22:39	Preparing to take a fluid sample. Got a pH drop here down to 5.9.	21.32509	144.19170	410	195	S5K06154.jpg
2016-12-1	22:40	Repositioning the wand with the pump off.	21.32509	144.19170	410	195	
2016-12-1	22:41	Pump is on again. Switching over to a piston sample.	21.32509	144.19170	410	195	S5K06250.jpg
2016-12-1	22:42	HFS set for Piston #1. Sampling has not begun. Waiting to see if pH is going down and vehicle to settle.	21.32509	144.19170	410	194	S5K06313.jpg
2016-12-1	22:43	Tether is pulling the vehicle.	21.32509	144.19170	410	195	S5K06374.jpg
2016-12-1	22:45	Preparing to sample. Looks more stable as 5m paid out.	21.32509	144.19170	410	198	S5K06486.jpg
2016-12-1	22:46	S34-HFS-01 Started. Piston #1 in soft sediment surround by flatfish with low pH and 10deg above ambient temperature.	21.32509	144.19170	410	198	S5K06541.jpg
2016-12-1	22:47	S34-HFS-01 is the sample. Pump appears to be working fine. Drop in pH before sampling took place.	21.32509	144.19170	410	198	S5K06624.jpg
2016-12-1	22:50	Stopped sample. Tmax=23.6 Tavg=13.5 T2=14 Vol=600 On volcanoclastic sediment with 10deg temperature anomaly at 10cm depth.	21.32509	144.19170	410	199	S5K06769.jpg
2016-12-1	22:50	Highlights turned on at 22:46 and turned off at 22:50 to show close up of sediment and sulfur, and sampling area	21.32509	144.19170	410	199	S5K06812.jpg
2016-12-1	22:51	Using 'fg' to indicate 'Framegrab' when just taking a quick image.	21.32509	144.19170	410	199	S5K06879.jpg
2016-12-1	22:53	Took another highlight during the sampling.	21.32509	144.19170	410	197	S5K06973.jpg
2016-12-1	22:54	Science camera display switched to old photos of dock in Guam.	21.32509	144.19170	410	197	
2016-12-1	22:55	Taking another pH reading with the HFS.	21.32509	144.19170	410	197	S5K07076.jpg
2016-12-1	22:56	The sediment now appears darker when the biobox lid opened and shut resulting in blowing the lighter sediment away.	21.32509	144.19170	410	197	S5K07145.jpg
2016-12-1	22:58	The suction sampler is set on chamber 8 which is the flush jar.	21.32509	144.19170	410	196	S5K07289.jpg
2016-12-1	22:59	Returning the HFS wand to the holster.	21.32509	144.19170	410	196	
2016-12-1	22:59	Going to try to use the suction sampler to collect some fish here. Will use the 2mm screen chamber (largest mesh) to capture the fish.	21.32509	144.19170	410	196	
2016-12-1	23:01	HFS back in the holster will pick up the suction intake next.	21.32509	144.19170	410	196	S5K07462.jpg
2016-12-1	23:03	Picked up suction intake.	21.32509	144.19170	410	196	S5K07546.jpg
2016-12-1	23:03	Moving suction chamber to #6.	21.32509	144.19170	410	196	
2016-12-1	23:04	Already flushed to 8 and moved to chamber 6.	21.32509	144.19170	410	196	
2016-12-1	23:05	S34-Bio-02 Suction is on now. Trying to get a fish.	21.32509	144.19170	410	196	S5K07711.jpg
2016-12-1	23:07	Trying to suction a fish.	21.32509	144.19170	410	195	S5K07781.jpg
2016-12-1	23:07	Sediment appears to be flushing out of the chamber but no fish yet.	21.32509	144.19170	410	195	
2016-12-1	23:09	Looked like one went in but not seeing it in the chamber.	21.32509	144.19170	410	195	S5K07955.jpg
2016-12-1	23:10	There are a few fish in the sample jar.	21.32509	144.19170	410	195	S5K07995.jpg
2016-12-1	23:11	At least 3 fish in the chamber at the moment. Want to get about 5.	21.32509	144.19170	410	195	S5K08043.jpg
2016-12-1	23:12	Fish are in suction chamber #6 with a 2mm mesh. S34-Bio-02 is the sample number.	21.32509	144.19170	410	195	S5K08099.jpg
2016-12-1	23:13	Got another fish so that should be at least 4 in the chamber.	21.32509	144.19170	410	194	S5K08183.jpg
2016-12-1	23:17	Great views of the bacterial mat on top of the sediment while fishing.	21.32509	144.19170	410	193	S5K08414.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-1	23:20	Might be 4 fish in that sample. Re-indexing to another chamber and will try another sample.	21.32509	144.19170	410	191	S5K08612.jpg
2016-12-1	23:21	HD recording restarted at 23:18 but still says Capture0001.mov. Hopefully it has worked	21.32509	144.19170	410	191	
2016-12-1	23:21	Flushing to chamber 8.	21.32509	144.19170	410	191	
2016-12-1	23:23	Coming off the bottom to slightly reposition for more fish catching.	21.32509	144.19170	410	190	S5K08760.jpg
2016-12-1	23:24	Moved slightly forward and to port where there are high densities of fish.	21.32509	144.19171	409	189	S5K08834.jpg
2016-12-1	23:25	S34-Bio-03 Second suction sample of flatfish at the same location in 10deg warmer than ambient water sediments.	21.32509	144.19171	410	187	S5K08913.jpg
2016-12-1	23:26	We are still approximately 10m east of waypoint #1.	21.32509	144.19171	410	186	
2016-12-1	23:29	No fish in the chamber yet but quite a bit of sediment.	21.32509	144.19171	410	185	S5K09133.jpg
2016-12-1	23:32	There is one fish maybe two in the chamber. Sample is complete.	21.32509	144.19171	410	183	S5K09322.jpg
2016-12-1	23:33	Stowing the suction hose.	21.32509	144.19171	410	183	
2016-12-1	23:36	The nav screen is showing about 4m of drift in the vehicle while we were stationary.	21.32509	144.19171	410	183	S5K09549.jpg
2016-12-1	23:37	We are going to pick up and scan around for some white smoke that was observed during the descent.	21.32509	144.19171	410	183	
2016-12-1	23:38	Off bottom and scanning to the north.	21.32508	144.19171	405	202	
2016-12-1	23:38	Lots of smoke and a nice vent.	21.32509	144.19168	402	224	S5K09696.jpg
2016-12-1	23:39	White smoker!	21.32509	144.19165	406	212	S5K09750.jpg
2016-12-1	23:39	Gas bubbles and particulate sulfur coming out of the seafloor. Can see sulfur crust in background.	21.32509	144.19166	407	215	S5K09762.jpg
2016-12-1	23:40	Bright patches of yellow sulfur.	21.32509	144.19166	407	201	S5K09812.jpg
2016-12-1	23:41	Nice fissure.	21.32507	144.19167	407	251	1480635684132S5K09846.jpg
2016-12-1	23:42	Positioning the vehicle to sample upwind of the white plume. Seeing gas bubbles coming out of the cracks. Flanges of sulfur crust.	21.32505	144.19167	406	301	S5K09896.jpg
2016-12-1	23:43	Nice view of sulfur crust next to the white plume.	21.32505	144.19166	408	275	S5K09946.jpg
2016-12-1	23:43	Bubbles look like they have a filmy coating on them possibly a hydrate which would indicate a lower temperature where they are coming out.	21.32505	144.19166	408	292	S5K09975.jpg
2016-12-1	23:44	A crab was observed near the plume. Fish were also observed on top of the sulfur crust and that would be a great place for the fish trap.	21.32505	144.19165	408	282	S5K10026.jpg
2016-12-1	23:45	Preparing for a HFS sample. ROV is grabbing the intake for the HFS wand.	21.32505	144.19166	408	285	S5K10097.jpg
2016-12-1	23:46	Very Smokey here.	21.32505	144.19166	408	285	S5K10141.jpg
2016-12-1	23:46	Current must have changed and view is obscured with smoke and gas bubbles.	21.32505	144.19166	408	285	S5K10155.jpg
2016-12-1	23:47	Staying put and see if the view will clear in a few moments.	21.32506	144.19166	408	285	S5K10194.jpg
2016-12-1	23:49	Repositioning slightly to get a clearer view.	21.32506	144.19166	408	318	S5K10346.jpg
2016-12-1	23:50	Stream of gas bubbles from the cracks.	21.32506	144.19167	408	335	S5K10366.jpg
2016-12-1	23:51	Altimeter is not working at the moment.	21.32506	144.19166	405	291	

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-1	23:51	ROV is moving east but looking west while waiting for clearer views.	21.32508	144.19169	404	260	S5K10460.jpg
2016-12-1	23:52	See the crust again and the plume.	21.32505	144.19166	406	244	S5K10503.jpg
2016-12-1	23:53	The plume appears to be in a slight hole or depression.	21.32502	144.19167	406	251	S5K10553.jpg
2016-12-1	23:53	Several crabs on the sulfur flow.	21.32501	144.19166	406	241	S5K10583.jpg
2016-12-1	23:55	Many crabs in this area. Looking for a good place to sample the plume	21.32500	144.19164	406	251	S5K10663.jpg
2016-12-1	23:57	Working around the cloudy water to find a sampling site with a clear view.	21.32504	144.19172	406	213	S5K10829.jpg
2016-12-1	23:58	Bright microbial mat seen within the plume.	21.32500	144.19173	403	242	S5K10874.jpg
2016-12-1	23:59	Altimeter is now working.	21.32502	144.19174	406	253	
2016-12-1	23:59	High densities of the flatfish on the sediments.	21.32502	144.19171	406	264	S5K10944.jpg
2016-12-2	0:00	Clearer view of plume.	21.32511	144.19169	407	206	S5K11013.jpg
2016-12-2	0:01	Several plumes of white from this side.	21.32513	144.19166	406	192	S5K11021.jpg
2016-12-2	0:01	We are now viewing uphill which is fortunate with the plume current for sampling.	21.32512	144.19164	406	179	S5K11049.jpg
2016-12-2	0:01	Had a drop of 1 pH unit as we were maneuvering above these plumes.	21.32512	144.19165	408	189	S5K11080.jpg
2016-12-2	0:02	Can see bubbles and plume out of some of the holes.	21.32510	144.19165	409	192	S5K11134.jpg
2016-12-2	0:03	Several holes emitting gas and plume in front of ROV.	21.32509	144.19167	409	224	S5K11177.jpg
2016-12-2	0:04	Sulfur crust pieces and crabs as well.	21.32509	144.19167	410	222	S5K11204.jpg
2016-12-2	0:05	Want the clearer water coming out to the left of gas & milky emissions.	21.32510	144.19167	409	222	S5K11292.jpg
2016-12-2	0:06	Sample site.	21.32510	144.19168	409	223	S5K11340.jpg
2016-12-2	0:06	highlights on	21.32510	144.19168	409	223	
2016-12-2	0:07	Water here is only 1deg above ambient so will reposition slightly.	21.32510	144.19168	409	223	
2016-12-2	0:08	Temperature is going up here...19.6...over 20.	21.32509	144.19167	409	222	S5K11479.jpg
2016-12-2	0:09	Wand tip may be in sediment. pH has dropped down 3 units (5.2) and temperature is over 40deg.	21.32509	144.19167	409	222	S5K11528.jpg
2016-12-2	0:10	The pH is dropping still and temperature is above 42°C. (pH now 4.187).	21.32509	144.19167	409	222	S5K11584.jpg
2016-12-2	0:11	pH down to 4.1 (maybe subtract half a unit for calibration). Stopped observation.	21.32509	144.19167	409	221	S5K11640.jpg
2016-12-2	0:12	Temperature has climbed to 73.5deg.	21.32509	144.19167	409	220	S5K11692.jpg
2016-12-2	0:12	Started Piston #2.	21.32509	144.19167	409	220	S5K11725.jpg
2016-12-2	0:13	Crabs observing the fluid sampler.	21.32509	144.19167	409	220	S5K11788.jpg
2016-12-2	0:14	This is S34-HFS-04 titanium piston #2. Temperature is above 72deg. pH at this site was down to 4.1.	21.32509	144.19167	409	220	
2016-12-2	0:16	Stop. Tmax=74.3 Tavg=69.7 vol=602 T2=40. Volcanoclastic sand near gas bubbles and sulfur smoke.	21.32510	144.19167	409	220	S5K11945.jpg
2016-12-2	0:17	Piston #3 S34-HFS-05 at the exact same location as HFS-04.	21.32510	144.19167	409	220	S5K12034.jpg
2016-12-2	0:19	Framegrabs of crabs.	21.32510	144.19167	409	220	S5K12117.jpg
2016-12-2	0:22	Stop. Tmax=70.5 Tavg=68.8 vol=603 T2=35. Same location for Piston #3.	21.32510	144.19167	409	220	
2016-12-2	0:23	Taking some gauge readings.	21.32510	144.19167	409	220	S5K12346.jpg
2016-12-2	0:23	HD new file started at 00:24	21.32510	144.19167	409	220	

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-2	0:24	Taking some HFS sensor readings now.	21.32510	144.19167	409	219	S5K12436.jpg
2016-12-2	0:24	Three crabs sitting on the sulfur sediment.	21.32510	144.19167	409	219	S5K12460.jpg
2016-12-2	0:25	pH has dropped down to 3.3 (will be adjusted later when calibrated). Guessing actual to be around 2.7.	21.32509	144.19167	409	219	
2016-12-2	0:26	Highlights off at 00:14. On again at 00:17 and off at 00:22. Can't log on and off while sample series is open.	21.32509	144.19167	409	219	
2016-12-2	0:26	Fish may not want to live on this hotter & acidic region but the crabs seem to be ok here.	21.32510	144.19167	409	219	S5K12540.jpg
2016-12-2	0:27	Lasers are on.	21.32510	144.19166	409	219	S5K12619.jpg
2016-12-2	0:28	Down to pH 3.2 at this sensor reading. Done reading.	21.32510	144.19167	409	219	
2016-12-2	0:29	Highlights on 00:27, off 00:29. Crabs, venting fissure, bubbles, yellow S.	21.32510	144.19167	409	219	S5K12733.jpg
2016-12-2	0:29	S34-HFS-06 DNA filter #13 for Julie Huber at the same location as the previous HFS samples.	21.32510	144.19167	409	219	S5K12743.jpg
2016-12-2	0:31	Tiny and large crabs.	21.32510	144.19167	409	219	S5K12882.jpg
2016-12-2	0:32	All these samples have been collected about 10m to the east of the original Fish Spa target taken from 2016 <i>Okeanos</i> Leg 3, Dive 9.	21.32510	144.19167	409	219	S5K12903.jpg
2016-12-2	0:35	Observed a fish swim over the crab and accelerate over the plume of warm water.	21.32510	144.19167	409	219	S5K13086.jpg
2016-12-2	0:36	Little chimney of sulfur blobs with gas bubbles out of the top.	21.32510	144.19167	409	219	S5K13136.jpg
2016-12-2	0:36	Gas bubbles have a white coating on them that are coming out of the tiny chimlets.	21.32510	144.19167	409	219	S5K13177.jpg
2016-12-2	0:37	White filmy coating may just be elemental sulfur on the gas bubbles.	21.32510	144.19167	409	219	S5K13218.jpg
2016-12-2	0:46	Stop. Tmax=67.2 Tavg=59.9 vol=3002 T=35. Same site as pistons 2 & 3.	21.32510	144.19167	409	218	S5K13758.jpg
2016-12-2	0:49	Stowing the HFS sampler and will prepare to grab the sulfur chimlet. Flushing out the Beast of the acidic water while waiting.	21.32510	144.19167	409	215	
2016-12-2	0:50	Going to try a metal scoop to capture one of the chimlets. Plastic scoop probably won't melt but safer to use the metal one.	21.32510	144.19167	409	215	S5K13997.jpg
2016-12-2	0:54	Sediment is very soft and scoop was quickly disappearing into the sand.	21.32510	144.19167	409	216	S5K14246.jpg
2016-12-2	0:55	Scoop was placed in sediment to get a better grip for sampling.	21.32510	144.19167	409	216	S5K14283.jpg
2016-12-2	0:55	We have determined that audio is being streamed to shore for the live YouTube video, but it is not currently being recorded with the video to the 4K, HD, or H264 files.	21.32510	144.19167	409	216	
2016-12-2	0:56	View of chimlets.	21.32510	144.19167	409	216	S5K14360.jpg
2016-12-2	0:56	Attempting to scoop up a sulfur blob chimney.	21.32510	144.19167	409	216	S5K14379.jpg
2016-12-2	1:00	Seems like a bit solid underneath.	21.32510	144.19167	409	217	S5K14578.jpg
2016-12-2	1:00	Has a deep root.	21.32510	144.19167	409	217	S5K14605.jpg
2016-12-2	1:01	Sample.	21.32510	144.19167	409	218	S5K14626.jpg
2016-12-2	1:01	S34-Geo-07 The sulfur chimlet for Heidi. Place in STBD forward box.	21.32510	144.19167	409	218	S5K14666.jpg
2016-12-2	1:06	In the biobox on STBD side. Chimlet where last HFS samples were taken.	21.32510	144.19167	410	222	S5K14955.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-2	1:10	From the overhead camera can tell the sample has a large piece intact inside the biobox.	21.32510	144.19167	410	224	S5K15164.jpg
2016-12-2	1:10	Closing biobox lid and next will take some overview framegrabs of the sample site.	21.32510	144.19167	410	224	
2016-12-2	1:11	Bringing in the tray for a better view.	21.32510	144.19167	410	224	S5K15224.jpg
2016-12-2	1:11	Can see fissure and the vents.	21.32510	144.19167	410	224	S5K15268.jpg
2016-12-2	1:12	Best view of chimlets and smoke.	21.32510	144.19167	410	224	S5K15292.jpg
2016-12-2	1:12	Could be a sulfate in the view.	21.32510	144.19167	410	224	S5K15328.jpg
2016-12-2	1:14	Need to move the ROV slightly to sample the white material to determine if it is sulfur, microbial mat or sulfate.	21.32510	144.19167	410	224	S5K15427.jpg
2016-12-2	1:16	That is the material wanted.	21.32510	144.19167	409	219	S5K15529.jpg
2016-12-2	1:16	Material is fairly solid and doesn't want to break.	21.32510	144.19167	409	220	S5K15569.jpg
2016-12-2	1:17	Large piece fell off but did not go into the sample scoop.	21.32510	144.19167	409	220	S5K15628.jpg
2016-12-2	1:20	Very large piece of white material. Fell off the scoop.	21.32510	144.19167	409	220	S5K15769.jpg
2016-12-2	1:21	S34-bio-08 Scoop of white-solid material that was near the chimlets. Going in the aft biobox in the STBD side of the box. Small piece fell off the scoop but still have a large piece.	21.32510	144.19167	409	221	S5K15855.jpg
2016-12-2	1:26	Deciding the next step.	21.32510	144.19167	410	223	S5K16159.jpg
2016-12-2	1:26	Going to deploy the fish trap on sulfur crust with a lot of fish where we originally landed.	21.32510	144.19167	410	223	S5K16177.jpg
2016-12-2	1:28	HD new file started	21.32510	144.19167	409	220	
2016-12-2	1:29	Pulling off the bottom and going slightly to STBD where there appears to be sulfur crust.	21.32510	144.19168	409	221	S5K16315.jpg
2016-12-2	1:30	Here is the original plume of water in the pit when we landed.	21.32504	144.19168	405	227	S5K16370.jpg
2016-12-2	1:30	ROV still facing across slope instead of upslope.	21.32504	144.19168	405	198	S5K16398.jpg
2016-12-2	1:30	Panning port and doesn't look very promising.	21.32502	144.19168	405	156	S5K16418.jpg
2016-12-2	1:30	Many highlight videos made while sampling Geo:	21.3250234	144.19168	405	154	
2016-12-2	1:32	Good crust in pilot view.	21.32502	144.19166	405	248	S5K16494.jpg
2016-12-2	1:34	Looks like crust here but not many fish. Could be too close to the venting.	21.32500	144.19165	405	247	S5K16619.jpg
2016-12-2	1:35	There are some fish here.	21.32498	144.19165	405	211	S5K16681.jpg
2016-12-2	1:35	Crust!	21.32495	144.19165	402	211	S5K16714.jpg
2016-12-2	1:36	Looks good here for fish trap.	21.32495	144.19165	402	203	S5K16727.jpg
2016-12-2	1:36	Looks like the upper edge of a crater.	21.32494	144.19164	401	192	S5K16745.jpg
2016-12-2	1:37	Plenty of flatfish on the surface of this crusty edge. Preparing to deploy the trap filled with Fancy Feast cat food.	21.32493	144.19166	402	211	S5K16810.jpg
2016-12-2	1:39	Grabbing the fish trap out of the port biobox preparing for deployment.	21.32493	144.19166	403	215	S5K16910.jpg
2016-12-2	1:40	Preparing to deploy the fish trap.	21.32493	144.19166	403	213	S5K16981.jpg
2016-12-2	1:40	Fish not nearly as active as the ones were on the sediment.	21.32493	144.19166	403	214	S5K17010.jpg
2016-12-2	1:41	DEPLOY Fish trap near Fish Spa on sulfur crust on edge.	21.32493	144.19166	403	214	S5K17065.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-2	1:42	Going to deploy a marker here. Navigation noted the fish trap as a digital marker.	21.32493	144.19166	403	215	S5K17102.jpg
2016-12-2	1:43	DEPLOY Marker 132 was grabbed.	21.32493	144.19166	403	213	S5K17161.jpg
2016-12-2	1:44	Mkr-132 deployed at Fish trap deployment near Fish Spa. The base of the marker is within a meter of the trap.	21.32493	144.19166	403	214	S5K17212.jpg
2016-12-2	1:45	Best view of the marker-can't see the number but it is Mkr-132.	21.32493	144.19166	403	214	
2016-12-2	1:46	Flushing the suction sampler and preparing to collect more fish.	21.32493	144.19166	403	215	S5K17341.jpg
2016-12-2	1:46	Fish in trap already!	21.32494	144.19167	403	215	S5K17372.jpg
2016-12-2	1:47	Going to suction into the 1mm chamber #5.	21.32497	144.19163	403	215	S5K17434.jpg
2016-12-2	1:48	Suction site near fish trap.	21.32494	144.19165	403	215	S5K17487.jpg
2016-12-2	1:49	S34-bio-09 Suctioning into 1mm mesh chamber #5. Suction within 1m of the fish trap, further from the edge of the crust-ledge.	21.32493	144.19165	403	215	S5K17507.jpg
2016-12-2	1:51	None in chamber yet.	21.32493	144.19166	403	216	S5K17642.jpg
2016-12-2	1:53	Quite a bit of sediment in jar #5 but haven't seen any fish yet.	21.32494	144.19166	403	210	S5K17782.jpg
2016-12-2	2:00	Still trying to get fish.	21.32494	144.19166	403	212	
2016-12-2	2:05	One fish in the jar!	21.32502	144.19142	403	193	
2016-12-2	2:09	Putting away suction sampler. Will take temp. Different fish swam by, <i>Mictophid</i> . Great view of S droplets.	21.32497	144.19156	403	198	S5K18747.jpg
2016-12-2	2:11	Fish trap rolled downhill a bit.	21.32498	144.19158	403	198	S5K18866.jpg
2016-12-2	2:12	One fish at top of fish trap.	21.32500	144.19158	403	198	S5K18937.jpg
2016-12-2	2:17	Transferred scoop from port to STBD manipulator in order to take a temperature of the sediment here.	21.32496	144.19164	403	200	S5K19222.jpg
2016-12-2	2:18	Probe is in the sediment up to the elbow bend. 18.02°C which is slightly above ambient in about 10cm of sediment. High was 18.31°C.	21.32497	144.19164	403	200	S5K19299.jpg
2016-12-2	2:20	Moved probe to the right closer to the base of Mkr-132 anchor. High temp was 16.7°C here.	21.32496	144.19165	403	201	S5K19409.jpg
2016-12-2	2:21	Moved slightly more to the right for third reading.	21.32496	144.19166	403	201	S5K19470.jpg
2016-12-2	2:22	Temperature at third spot is 16.70°C.	21.32495	144.19166	403	201	S5K19491.jpg
2016-12-2	2:23	Moving as far left and away as possible in this location.	21.32495	144.19166	403	201	S5K19568.jpg
2016-12-2	2:23	Background is 14.4-14.5°C.	21.32495	144.19166	403	203	S5K19599.jpg
2016-12-2	2:24	Fourth temperature reading is a bit warmer here 19.78°C away from the edge of the ledge.	21.32495	144.19166	403	203	S5K19613.jpg
2016-12-2	2:26	Moved further to the left of the last reading.	21.32495	144.19166	403	207	
2016-12-2	2:26	Overall had a 5deg temperature anomaly. This location has a max of 18.6°C.	21.32495	144.19166	403	206	S5K19781.jpg
2016-12-2	2:28	Stowing the temperature probe and will want a sample of the sulfur crust near the edge of the pit here.	21.32495	144.19166	403	207	
2016-12-2	2:30	Going to move over to the right, around the fish trap to grab a piece of sulfur crust with the manipulator.	21.32495	144.19166	403	207	S5K20018.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-2	2:32	The highlight video capability is not working. In order to reestablish its connection the HD camera will be temporarily turned off.	21.32494	144.19166	403	207	S5K20131.jpg
2016-12-2	2:34	Edge of crater and good view of Mkr-132. Going to try to grab a piece of the sulfur crust edge in the view.	21.32495	144.19165	402	203	S5K20202.jpg
2016-12-2	2:35	Nice view of the edge of the crate and smoke.	21.32493	144.19163	404	181	S5K20276.jpg
2016-12-2	2:36	HD new file started	21.32492	144.19162	403	177	
2016-12-2	2:36	Want to grab a piece of this edge.	21.32492	144.19162	403	178	S5K20352.jpg
2016-12-2	2:38	ROV is currently south of the Fish Spa and slightly north of east of waypoint #2 which is the sulfur pit. Navigation is excellent!	21.32492	144.19162	403	180	
2016-12-2	2:39	Fish on edge of crust.	21.32492	144.19162	403	180	S5K20521.jpg
2016-12-2	2:41	Nice view of the edge with a tiny window down into the pit.	21.32492	144.19162	403	179	S5K20625.jpg
2016-12-2	2:42	Nice sample of the crust.	21.32492	144.19162	403	180	
2016-12-2	2:42	S34-Geo-10. Piece of sulfur crust from the edge of the sulfur pit. Had a fish nearby before taken.	21.32492	144.19162	403	180	S5K20690.jpg
2016-12-2	2:43	Will place in forward biobox.	21.32492	144.19162	403	180	S5K20786.jpg
2016-12-2	2:44	Preparing to place in biobox. Need to open the box.	21.32492	144.19162	403	180	S5K20821.jpg
2016-12-2	2:46	Placing in the biobox.	21.32492	144.19162	403	180	S5K20960.jpg
2016-12-2	2:46	Sample placed in forward-port biobox. S34-Geo-10 for Heidi Berkenbosch.	21.32492	144.19163	403	180	S5K20978.jpg
2016-12-2	2:47	Put the sediment from the manipulator inside the box as well.	21.32492	144.19162	403	180	S5K21022.jpg
2016-12-2	2:47	Highlights on for sample S34-Geo-10. S crust from overhang.	21.3249207	144.19162	403	180	S5K21026.jpg
2016-12-2	2:49	Moving on to waypoint #4 for a quick visual observation of the sulfur pool before going to waypoint #2.	21.32493	144.19161	402	176	S5K21126.jpg
2016-12-2	2:50	The navigation is excellent as we are at the waypoint and looking at the plume from the sulfur pool.	21.32491	144.19152	403	177	
2016-12-2	2:52	Over the pit but view is obscured by the smoke.	21.32492	144.19150	402	176	S5K21300.jpg
2016-12-2	2:54	Can see some of the seafloor as we clear the smoke.	21.32498	144.19147	405	176	S5K21416.jpg
2016-12-2	2:54	See some sulfur (bright yellow) in the white sediments.	21.32503	144.19147	406	176	S5K21454.jpg
2016-12-2	2:56	Larger cloud of smoke.	21.32501	144.19136	406	173	S5K21522.jpg
2016-12-2	2:56	Is that the edge of the sulfur pond?	21.32489	144.19125	407	146	S5K21576.jpg
2016-12-2	2:57	Could be molten sulfur on the edge.	21.32484	144.19127	414	147	S5K21631.jpg
2016-12-2	2:58	It is just a hole-not the edge of the sulfur pond.	21.32484	144.19128	414	139	S5K21650.jpg
2016-12-2	2:58	Looks deep.	21.32481	144.19128	413	118	S5K21685.jpg
2016-12-2	2:59	Perhaps the level of the pond has dropped.	21.32479	144.19129	413	95	S5K21707.jpg
2016-12-2	2:59	Does not look accessible.	21.32478	144.19130	413	73	S5K21721.jpg
2016-12-2	3:00	Looking down the throat of the volcano!	21.32477	144.19131	409	82	S5K21792.jpg
2016-12-2	3:02	According to navigation the ROV has almost circumnavigated the entire pond (about 3/4 of the way counter-clockwise). Haven't gotten a view of the bottom yet.	21.32477	144.19147	414	45	S5K21904.jpg
2016-12-2	3:05	Clear!	21.32481	144.19153	405	99	S5K22121.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-2	3:06	Sulfur blobs are covering the vehicle.	21.32484	144.19156	405	105	S5K22144.jpg
2016-12-2	3:07	Ledge of sulfur and slabs of crust and marker in pilot cam.	21.32488	144.19157	405	100	S5K22182.jpg
2016-12-2	3:07	Nice view of the marker and fish trap area.	21.32487	144.19159	404	71	S5K22226.jpg
2016-12-2	3:08	Another good view of the marker.	21.32489	144.19160	403	73	S5K22260.jpg
2016-12-2	3:08	Can't see the fish trap-did it roll away?	21.32490	144.19160	403	77	S5K22289.jpg
2016-12-2	3:09	Sulfur is coating the vehicle so we must have been in cloud of molten sulfur.	21.32493	144.19158	403	81	S5K22336.jpg
2016-12-2	3:10	Fish trap has rolled downhill from the base of the marker.	21.32497	144.19157	403	99	S5K22395.jpg
2016-12-2	3:11	Need to retrieve the fish trap as it is continuing to roll down the hill.	21.32500	144.19159	402	132	S5K22458.jpg
2016-12-2	3:13	Trap is in a depression downslope from the marker.	21.32501	144.19160	405	149	S5K22543.jpg
2016-12-2	3:13	Grabbed it.	21.32500	144.19161	407	156	S5K22587.jpg
2016-12-2	3:18	Port manipulator coated in sulfur.	21.32490	144.19169	395	149	S5K22858.jpg
2016-12-2	3:20	Going to look for a more stable place to deploy the fish trap before assessing the vehicle's condition after the sulfur shower.	21.32490	144.19171	394	148	S5K22993.jpg
2016-12-2	3:21	New placement site for the fish trap.	21.32487	144.19174	397	150	S5K23065.jpg
2016-12-2	3:22	Trying to place the trap down and observing about 4-5 fish in the trap.	21.32488	144.19174	398	150	S5K23123.jpg
2016-12-2	3:23	Going to excavate a little ditch to keep the trap in place.	21.32488	144.19174	398	153	S5K23182.jpg
2016-12-2	3:24	New navigational marker at the redeployed site of the trap.	21.32488	144.19175	398	153	
2016-12-2	3:24	DEPLOY Fish trap at new location which is 12.5m SE from the marker. Bearing is 122deg.	21.32488	144.19175	398	153	S5K23259.jpg
2016-12-2	3:28	Fish trap is no longer at the Mkr-132 site however 4-5 fish came from the original site.	21.32488	144.19174	398	151	
2016-12-2	3:32	Going to try netting some fish in this location where the trap is located.	21.32488	144.19175	398	151	S5K23739.jpg
2016-12-2	3:33	Need to recover the vehicle early to assess the damage after the sulfur shower but will attempt a few more science tasks before the early recovery.	21.32488	144.19175	398	151	S5K23790.jpg
2016-12-2	3:34	Retrieving the net from the basket.	21.32488	144.19175	398	151	S5K23841.jpg
2016-12-2	3:35	HD new file started	21.32488	144.19174	398	151	
2016-12-2	3:36	Going to try and release the scoop covered in sulfur.	21.32488	144.19174	398	152	S5K23934.jpg
2016-12-2	3:37	Going to place the scoop in the port biobox. Should be room for the fish trap as well.	21.32488	144.19174	398	149	S5K24036.jpg
2016-12-2	3:38	Scoop is coated in sulfur in the manipulator.	21.32488	144.19174	398	150	S5K24076.jpg
2016-12-2	3:39	It came off the manipulator!	21.32488	144.19174	398	150	S5K24101.jpg
2016-12-2	3:40	The rack was jammed and the jaw of the manipulator is acting oddly.	21.32488	144.19174	398	150	S5K24169.jpg
2016-12-2	3:41	Going to try to wiggle the rack to get in unjammed from the sulfur glue.	21.32488	144.19174	398	150	S5K24278.jpg
2016-12-2	3:42	That worked and the rack is coming out!	21.32488	144.19174	398	150	S5K24307.jpg
2016-12-2	3:42	Can't do anymore suctioning but have the full rack available.	21.32488	144.19174	398	151	S5K24325.jpg
2016-12-2	3:44	Attempting to remove the sulfur off the sample net in order to get some fish samples.	21.32488	144.19174	398	152	S5K24423.jpg

Date	Time	S34 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-2	3:47	Not having much luck unfurling the net with the sulfur sticking it shut. Going to try to scoop some sediment to break it loose.	21.32488	144.19174	398	153	S5K24612.jpg
2016-12-2	3:48	Sediment is not too thick here as encountered some crust.	21.32488	144.19174	398	154	S5K24663.jpg
2016-12-2	3:51	Trying to unfurl still.	21.32488	144.19174	398	155	S5K24843.jpg
2016-12-2	3:52	Sulfur is holding the net together.	21.32488	144.19174	398	156	S5K24903.jpg
2016-12-2	3:52	Stowing the net in aft biobox. Visibility is degrading.	21.32488	144.19174	398	156	S5K24922.jpg
2016-12-2	3:54	The STBD AFT biobox opened and will stow the net in there.	21.32488	144.19174	398	157	S5K25017.jpg
2016-12-2	3:54	Actually got the PORT AFT lid opened and this biobox is one large compartment.	21.32488	144.19174	398	157	S5K25043.jpg
2016-12-2	3:56	Now will retrieve the fish trap in decreasing visibility.	21.32488	144.19174	398	157	S5K25146.jpg
2016-12-2	3:56	Strings of sulfur floating in the water.	21.32488	144.19174	398	157	S5K25175.jpg
2016-12-2	3:57	Seeing more molten sulfur raining down as this plume is engulfing the vehicle.	21.32488	144.19174	398	156	S5K25221.jpg
2016-12-2	3:59	Grabbed the trap.	21.32488	144.19175	398	162	S5K25339.jpg
2016-12-2	3:59	There are quite a few fish in the trap after only being deployed for a few hours.	21.32488	144.19175	398	161	S5K25361.jpg
2016-12-2	4:00	Placing the trap in the aft biobox.	21.32488	144.19175	398	161	S5K25386.jpg
2016-12-2	4:00	Safely in the biobox.	21.32488	144.19175	398	161	S5K25402.jpg
2016-12-2	4:01	RECOVER Fish Trap Sample of fish.	21.32488	144.19175	398	160	S5K25425.jpg
2016-12-2	4:01	Recovered fish trap after it was originally deployed at Mkr-132. Upon return it had rolled down the hill. Trap was recovered and redeployed temporarily at this location. There were at least 2 fish from the original location.	21.32488	144.19175	398	160	S5K25448.jpg
2016-12-2	4:04	The sulfur that has adhered to the ROV will be collected as a sample. The sulfur was erupted from the pond as liquefied globules which cooled and stuck to the vehicle.	21.32492	144.19180	401	279	
2016-12-2	4:06	HD recording turned off	21.32509	144.19177	381	265	
2016-12-2	4:06	Recovering the vehicle. Left the bottom.	21.32509	144.19181	378	266	

Table 6.6-2 Dive S35 – Daikoku

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-02	21:41	We are running the HFS sensors on the way down to get a profile of the water column. Started at 78 meters.	21.32507	144.19180	78	239	
2016-12-02	21:43	Floats all on, starting descent to the seafloor	21.32502	144.19182	95	249	
2016-12-02	21:50	HD recording of launch from approx. 21:25 to 21:50	21.32495	144.19151	221	46	
2016-12-02	21:52	Passing 260m	21.32505	144.19163	265	311	
2016-12-02	21:54	HD recording on	21.32508	144.19158	329	317	
2016-12-02	21:55	We are 40m above the bottom.	21.32511	144.19171	371	258	
2016-12-02	21:56	Seeing a lot of smoke in the water.	21.32515	144.19180	381	256	S5K01786.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-02	21:56	Seeing plume and bubbles. Stopped descent. pH has dropped a full unit since the surface and still dropping.	21.32518	144.19176	381	255	
2016-12-02	21:57	At 400m.	21.32525	144.19176	401	239	
2016-12-02	21:57	There is the bottom.	21.32525	144.19175	408	236	S5K01879.jpg
2016-12-02	21:58	Bottom has a white coating of sulfur crust and sediment.	21.32524	144.19173	412	218	S5K01907.jpg
2016-12-02	21:59	Completed the HFS sensor readings about a minute ago.	21.32524	144.19172	411	221	
2016-12-02	22:00	We approximately 15m NE of waypoint 1 at Fish Spa.	21.32523	144.19170	413	210	
2016-12-02	22:02	Moving upslope to look for a good placement of the fish traps on the sulfur crust.	21.32517	144.19166	411	206	S5K02178.jpg
2016-12-02	22:03	Fish visible on the seafloor.	21.32516	144.19165	410	200	
2016-12-02	22:03	Going to head to Mkr-132 for placement. It is at 23m 176deg from current position.	21.32516	144.19164	410	205	S5K02232.jpg
2016-12-02	22:04	Highlights on. Heaps of fish and scattered S crust on ash covered slope with some plume smoke around	21.32517	144.19163	411	176	
2016-12-02	22:04	Setting up for good views of the site for video.	21.32517	144.19163	411	174	S5K02296.jpg
2016-12-02	22:05	Going to get some hi-def video of the site.	21.32517	144.19163	410	174	S5K02342.jpg
2016-12-02	22:06	There are crabs and fish here. The crabs are cannibals and haven't been observed to actually catch and eat the fish.	21.32517	144.19163	411	178	S5K02396.jpg
2016-12-02	22:06	Turning lasers off.	21.32517	144.19163	411	176	
2016-12-02	22:08	Zooming and panning around a lot with the science camera.	21.32517	144.19163	411	179	S5K02499.jpg
2016-12-02	22:10	We are headed for the Mkr-132 to decide where to place the fish trap.	21.32513	144.19164	409	178	S5K02651.jpg
2016-12-02	22:10	Highlights off.	21.32511	144.19164	409	177	
2016-12-02	22:11	In the overhead view there are gas bubbles coming out of vents.	21.32511	144.19165	408	178	S5K02685.jpg
2016-12-02	22:11	We are 16m away from the marker so are going to come off the bottom and drive over due to the low visibility.	21.32511	144.19167	407	180	
2016-12-02	22:11	Lots of small S finger chimneys	21.32511	144.19167	406	178	S5K02708.jpg
2016-12-02	22:13	6m away to Mkr-132 site.	21.32501	144.19170	402	179	
2016-12-02	22:13	Visibility is much more degraded than yesterday.	21.32495	144.19173	402	182	S5K02850.jpg
2016-12-02	22:14	Did not see the marker and have decided to go upslope and away from the vent to get better visibility.	21.32495	144.19173	402	204	S5K02907.jpg
2016-12-02	22:15	Going to head east to go upslope.	21.32496	144.19172	402	118	
2016-12-02	22:16	Turning on HFS sensors.	21.32495	144.19176	403	117	
2016-12-02	22:16	HFS sensors are on.	21.32494	144.19177	401	119	
2016-12-02	22:17	Smoke is not getting better even though we have gone further east.	21.32490	144.19184	395	140	
2016-12-02	22:18	Bottom in sight again but water is still cloudy.	21.32490	144.19190	401	128	S5K03111.jpg
2016-12-02	22:18	The HFS pH has gone down to 7 from 8 since turning it on.	21.32489	144.19192	400	127	S5K03136.jpg
2016-12-02	22:19	Decided to go back to where we first landed due to better visibility. That was at waypoint #2 (Fish Spa).	21.32486	144.19195	398	127	
2016-12-02	22:20	Waypoint 2 is downslope from our current location.	21.32486	144.19194	393	268	

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-02	22:21	We are getting to the edge of the plume. Can see sulfur needles falling through the water.	21.32514	144.19172	405	247	
2016-12-02	22:21	Good view of the vents and crack, it could be the one sampled yesterday.	21.32514	144.19168	408	220	S5K03326.jpg
2016-12-02	22:22	S finger chimneys again	21.32514	144.19168	408	225	S5K03337.jpg
2016-12-02	22:22	The white material appears to be thicker and yellow sulfur patches are easily visible.	21.32514	144.19167	408	220	S5K03357.jpg
2016-12-02	22:23	Highlights on for group of S finger chimneys by small crater and fissure area	21.32514	144.19164	409	183	
2016-12-02	22:23	Taking some HD video shots here before deployment.	21.32514	144.19164	409	183	S5K03416.jpg
2016-12-02	22:23	Note the small depression with the venting in the image.	21.32514	144.19164	409	187	S5K03447.jpg
2016-12-02	22:25	Lots of crabs around the sulfur patches and fish are further from the active venting.	21.32514	144.19164	409	183	S5K03522.jpg
2016-12-02	22:26	Going to land in front of the vent and make camera observations.	21.32513	144.19164	409	173	S5K03592.jpg
2016-12-02	22:27	Looks like venting is along a crack leading to the edge of the pit.	21.32512	144.19165	409	173	S5K03655.jpg
2016-12-02	22:28	Great view of the venting along the cracks and in depressions.	21.32512	144.19165	410	172	S5K03719.jpg
2016-12-02	22:29	Crabs are in a cluster around a patch of different substrate compared to the fish which are on flatter sediment.	21.32512	144.19165	410	172	S5K03801.jpg
2016-12-02	22:30	Crab pile.	21.32513	144.19165	410	172	S5K03843.jpg
2016-12-02	22:32	Close-up of crabs with one burying in sediment.	21.32513	144.19166	410	171	S5K03934.jpg
2016-12-02	22:32	Scar and missing legs on crab top right.	21.32512	144.19165	410	171	S5K03957.jpg
2016-12-02	22:32	Crab in top right has been damaged, been in a battle. Missing a leg and carapace is damaged.	21.32512	144.19165	410	171	S5K03960.jpg
2016-12-02	22:33	Crab is missing 2 legs.	21.32512	144.19165	410	171	S5K03995.jpg
2016-12-02	22:33	Close-up of the injured crab.	21.32512	144.19165	410	171	S5K04018.jpg
2016-12-02	22:34	Highlights appear to not have been working for some time.	21.32512	144.19165	410	172	S5K04072.jpg
2016-12-02	22:34	Lights are changing.	21.32512	144.19165	410	172	S5K04080.jpg
2016-12-02	22:34	Iris control does not seem to be working.	21.32512	144.19165	410	172	S5K04103.jpg
2016-12-02	22:35	Highlights have been working in the van. Just not visible on the screen down here.	21.32513	144.19165	410	172	S5K04122.jpg
2016-12-02	22:35	Crab on its back is not dead as it just moved.	21.32513	144.19165	410	172	S5K04142.jpg
2016-12-02	22:36	Tiny gas bubble erupting just in front of the crab.	21.32512	144.19166	410	172	S5K04172.jpg
2016-12-02	22:36	Iris is working.	21.32512	144.19166	410	172	S5K04219.jpg
2016-12-02	22:37	Bubbles from a pit with sulfur coating in the background.	21.32512	144.19166	410	172	S5K04239.jpg
2016-12-02	22:37	Nice view of the crab pile with the bubble pit in the background. Fish are observed to swim through the bubbles but not landing near it.	21.32512	144.19165	410	170	S5K04280.jpg
2016-12-02	22:38	Can see flatfish further from the venting and staying away from the crab pile.	21.32512	144.19164	410	170	S5K04330.jpg
2016-12-02	22:39	Bubble Close-up.	21.32513	144.19166	410	170	S5K04366.jpg
2016-12-02	22:39	Can see piles of sulfur where the bubbles are emitting from.	21.32513	144.19166	410	170	1480718365664S5K04380.jpg
2016-12-02	22:40	Nice video of fish swimming through the bubbles.	21.32513	144.19164	410	170	S5K04416.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-02	22:40	Crab in the sediment near the sulfur.	21.32513	144.19164	410	170	S5K04469.jpg
2016-12-02	22:41	Several fish swam through the bubbles. Overall visibility is deteriorating.	21.32512	144.19164	410	170	S5K04526.jpg
2016-12-02	22:42	Current is coming from the east but the sulfur pit is to the west. Doesn't make sense.	21.32512	144.19166	410	170	S5K04552.jpg
2016-12-02	22:43	Wider view of the area of the video survey.	21.32513	144.19165	410	170	S5K04624.jpg
2016-12-02	22:44	Vigorous venting in the background near the edge of the pit.	21.32512	144.19165	410	170	S5K04680.jpg
2016-12-02	22:45	Backing up the ROV from the edge of the pit.	21.32511	144.19163	410	170	S5K04715.jpg
2016-12-02	22:46	Looking for a location that has a lot of fish and not crabs for the fish trap.	21.32513	144.19164	409	171	S5K04799.jpg
2016-12-02	22:46	Highlights off after Thom's filming of crab, fish, and venting area.	21.32514	144.19165	411	176	S5K04810.jpg
2016-12-02	22:47	Evaluating this site for the fish trap.	21.32514	144.19166	411	193	S5K04865.jpg
2016-12-02	22:48	This area is just several meters from where we were observing the venting. Moved just north as backed up.	21.32514	144.19166	411	192	S5K04905.jpg
2016-12-02	22:49	Too much of a slope for deployment.	21.32515	144.19166	410	190	S5K04972.jpg
2016-12-02	22:50	Stirred up the sediment.	21.32513	144.19161	409	171	S5K05058.jpg
2016-12-02	22:51	We had been moving a bit upslope to the west.	21.32513	144.19161	409	171	
2016-12-02	22:52	Framegrab of equipment on the basket.	21.32513	144.19161	410	170	S5K05166.jpg
2016-12-02	22:54	Opening biobox to retrieve the fish trap.	21.32512	144.19162	410	171	S5K05277.jpg
2016-12-02	22:54	Retrieving the black-tape fish trap.	21.32513	144.19162	410	171	S5K05309.jpg
2016-12-02	22:55	DEPLOY: Black Fish Trap. Dropping the fish trap on the sediment.	21.32514	144.19162	410	171	S5K05348.jpg
2016-12-02	22:57	Now setting up to do some HFS sampling with the cylinder attachment as opposed to the crevice attachment.	21.32513	144.19160	410	171	S5K05437.jpg
2016-12-02	22:59	Close-up of the HFS sampler	21.32513	144.19160	410	169	S5K05552.jpg
2016-12-02	23:00	Background is 13.3deg.	21.32513	144.19160	410	169	S5K05659.jpg
2016-12-02	23:01	Flush pump is on and exhaust is visible.	21.32513	144.19160	410	169	
2016-12-02	23:01	Taking sensor data with the HFS near the fish trap deployment.	21.32513	144.19161	410	169	
2016-12-02	23:02	pH is dropping down with the pumps on as well as the temperature has gone up. pH is really low compared to background. Went from 8.2 down to 5.9 just below the surface of the sediment with 14deg water.	21.32513	144.19161	410	169	
2016-12-02	23:03	Changing pump speed. Slowing the speed down.	21.32513	144.19161	410	169	
2016-12-02	23:03	There are a lot of fish on the sediment but can also see a few crabs.	21.32513	144.19161	410	169	
2016-12-02	23:04	Running only the sample pump, slowly pulling water in. pH is stable at 6.16 and O2 is 3.98.	21.32513	144.19161	410	169	
2016-12-02	23:05	O2 is ml/l for the reading.	21.32513	144.19161	410	169	
2016-12-02	23:05	Close-up of the fish trap.	21.32513	144.19161	410	169	S5K05964.jpg
2016-12-02	23:06	Done with sensors.	21.32513	144.19161	410	169	
2016-12-02	23:09	S35-HFS-01 Filtered Piston #1. PVC piston. In sediment next to black-tape fish trap. Start 23:09.	21.32513	144.19161	410	169	S5K06163.jpg
2016-12-02	23:10	Location is just about 6m east of north from the waypoint at Fish Spa.	21.32513	144.19161	410	169	S5K06270.jpg
2016-12-02	23:13	Stop 23:13. S35-HFS-01. Tmax=23.6 Tavg=19.1 vol=750 T2=15.	21.32513	144.19161	410	169	S5K06417.jpg
2016-12-02	23:15	Flatfish in the sediment.	21.32513	144.19160	410	169	S5K06558.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-02	23:16	Sulfur bubble.	21.32512	144.19161	410	169	S5K06581.jpg
2016-12-02	23:16	Sulfur with strands.	21.32513	144.19161	410	169	S5K06602.jpg
2016-12-02	23:16	S35-HFS-02 Start 23:16 Unfiltered Bag #16. At exact same location as previous sample.	21.32513	144.19161	410	169	S5K06623.jpg
2016-12-02	23:16	HD new file started.	21.32513	144.19161	410	169	S5K06625.jpg
2016-12-02	23:17	Highlights. Sediments and fish close up. 23:13 to 23:15	21.32513	144.19161	410	169	S5K06642.jpg
2016-12-02	23:17	Highlight. Fresh S bubble still gas-filled and bobbing on bottom. Thin hairs connecting it to other S bubble. Glassy appearance. Start 23:16	21.32513	144.19161	410	169	S5K06678.jpg
2016-12-02	23:18	Less fish here on the lighter sediment than on the darker sediment to the left of the view.	21.32513	144.19161	410	169	S5K06736.jpg
2016-12-02	23:19	Highlights off. 23:19	21.32513	144.19161	410	169	S5K06790.jpg
2016-12-02	23:20	S35-HFS-02 Stop 23:20. Tmax=21.6 Tavg=20.9 vol=530 T2=15	21.32513	144.19161	410	169	S5K06840.jpg
2016-12-02	23:21	S35-HFS-03 Start 23:21. RNA filter #14 at the same location.	21.32512	144.19160	410	169	S5K06914.jpg
2016-12-02	23:23	S35-HFS-03. Temp going up to 28°C.	21.32513	144.19161	410	169	S5K07029.jpg
2016-12-02	23:25	More smoke coming from vent in front of us.	21.32513	144.19161	410	169	S5K07159.jpg
2016-12-02	23:26	Current or venting changed while sampling as smoke plume coming up behind the vehicle.	21.32513	144.19161	410	169	S5K07225.jpg
2016-12-02	23:27	While sampling the temperature in the sediment went up at the same time the plume was observed in the background.	21.32513	144.19161	410	169	S5K07263.jpg
2016-12-02	23:29	Plume is coming from the east as seen from the camera on the sampling arm. Temperature is still increasing during sampling.	21.32513	144.19161	410	168	S5K07397.jpg
2016-12-02	23:30	Animals living on the sediment are experiencing different temperatures during pulses from the volcano.	21.32513	144.19161	410	168	
2016-12-02	23:31	The intake is 3-4cm into the sediment with this cylinder cage around the wand tip.	21.32513	144.19161	410	168	S5K07514.jpg
2016-12-02	23:33	Temperature has doubled relative to the background while taking this sample. Cylinder tip is about half-way down into the sediment.	21.32513	144.19161	410	167	S5K07598.jpg
2016-12-02	23:34	Maximum zoom of the sulfur Pele's tear.	21.32513	144.19160	410	167	S5K07707.jpg
2016-12-02	23:34	Close up S droplets in sediment. Light grey one in foreground in bobbing, still has gas in it.	21.32513	144.19160	410	167	S5K07709.jpg
2016-12-02	23:37	S35-HFS-03 Stop 23:37. Tmax=31.5 Tavg=29.8 vol=3000 T2=17. Exact same location as previous.	21.32513	144.19161	410	167	S5K07881.jpg
2016-12-02	23:38	HFS sensor readings.	21.32513	144.19161	410	167	
2016-12-02	23:39	Sensor reading while sampling for O2 went down but when done and turned on the sensors/pumping it went back up.	21.32513	144.19161	410	167	
2016-12-02	23:40	pH is fairly high at 7.5 and the O2 is climbing. Sensors are still running.	21.32513	144.19161	410	167	
2016-12-02	23:40	Stopping sensors.	21.32513	144.19161	410	167	
2016-12-02	23:41	S35-HFS-04 Start 23:41 Unfiltered piston #2. At the exact same location at 6m north of waypoint #2 Fish Spa.	21.32512	144.19160	410	167	S5K08131.jpg
2016-12-02	23:43	Close-up of fish trap.	21.32516	144.19159	410	167	S5K08231.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-02	23:44	There are no fish in the trap yet.	21.32514	144.19161	410	167	S5K08273.jpg
2016-12-02	23:46	S35-HFS-04 Stop 23:46. Tmax=29.2 Tavg=29.1 vol=700 T2=17 At same location.	21.32513	144.19161	410	167	
2016-12-02	23:48	S35-HFS-05 Start 23:48. Filtered Bag #17. At exact same location.	21.32513	144.19161	410	167	S5K08537.jpg
2016-12-02	23:51	S35-HFS-05 Stop 23:51. Tmax=28.6 Tavg=27.6 vol=400 T2=16 At same location.	21.32513	144.19161	410	166	
2016-12-02	23:51	HFS sensors on since the temperature was changing. Temperature went down on that last sample.	21.32513	144.19161	410	166	
2016-12-02	23:52	Sensors are actually on now.	21.32513	144.19160	410	166	
2016-12-02	23:53	Background water temperature is 13deg and sediment is 27deg with the wand several cm down into the sediment.	21.32513	144.19160	410	166	
2016-12-02	23:54	Flush pump is off and pH is dropping. Temperature dropped as expected.	21.32513	144.19160	410	166	
2016-12-02	23:58	Not getting good readings when the flush pump is on from the HFS sensors.	21.32513	144.19161	410	166	
2016-12-02	23:59	Sensor data now is more trustworthy than when actual HFS samples were taken.	21.32512	144.19161	410	166	
2016-12-03	00:00	Smoke has dissipated a bit.	21.32513	144.19160	410	166	S5K09258.jpg
2016-12-03	00:01	New sensor readings are pH=4.65 O2=1.27 ml/l with flush pump OFF.	21.32513	144.19160	410	166	S5K09298.jpg
2016-12-03	00:05	S35-HFS-06 Start 00:05. Filtered Piston #3 with flush pump OFF. At same location. Other piston samples were taken with the flush pump ON.	21.32513	144.19161	410	166	S5K09523.jpg
2016-12-03	00:06	School of another species of fish. <i>Mictophids</i> perhaps. A large school of non-vent fish.	21.32513	144.19160	410	166	S5K09620.jpg
2016-12-03	00:08	S35-HFS-06 Stop 00:08. Tmax=28.2 Tavg=19.0 vol=600 T2=15 Sample in same location but with the flush pump OFF.	21.32514	144.19161	410	166	
2016-12-03	00:10	Going to retrieve the HFS wand and the fish trap. Not seeing enough fish at this location.	21.32513	144.19161	410	166	S5K09818.jpg
2016-12-03	00:11	Retrieving wand temporarily while repositioning nearby.	21.32513	144.19160	410	166	
2016-12-03	00:11	HD new file started.	21.32513	144.19160	410	166	S5K09902.jpg
2016-12-03	00:11	Inside of HFS cylinder.	21.32514	144.19160	410	166	S5K09920.jpg
2016-12-03	00:12	View of inside HFS wand intake.	21.32514	144.19160	410	166	
2016-12-03	00:12	Taking view of intake while pump is running. Shaking out some of the sediment.	21.32513	144.19160	410	166	S5K09953.jpg
2016-12-03	00:13	Clear enough.	21.32513	144.19161	410	166	S5K09992.jpg
2016-12-03	00:13	Wand in the holster.	21.32512	144.19161	410	166	S5K10029.jpg
2016-12-03	00:15	Going to take a HFS sensor reading just above the surface before retrieving the fish trap.	21.32513	144.19161	410	166	S5K10134.jpg
2016-12-03	00:15	Highlight. <i>SuBastian</i> grabbing the HFS with fish trap in the background.	21.32513	144.19161	410	166	S5K10173.jpg
2016-12-03	00:17	Highlights off.	21.32513	144.19161	410	166	S5K10274.jpg
2016-12-03	00:18	Close-up of the wand tip just above the surface for a sensor reading.	21.32513	144.19160	410	166	S5K10309.jpg
2016-12-03	00:18	Turning sensor ON for reading just above the sediment.	21.32513	144.19160	410	166	1480724331674S5K10346.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	00:19	Whoops-wand entered the sediment.	21.32513	144.19161	410	166	S5K10372.jpg
2016-12-03	00:19	Flush pump was turned off.	21.32513	144.19161	410	165	
2016-12-03	00:20	Flush pump is now turned back ON but the sensors were running all the time. Flow observed.	21.32513	144.19162	410	165	S5K10430.jpg
2016-12-03	00:21	Wand tip is not steady as it slightly pulled up off the surface.	21.32513	144.19162	410	165	
2016-12-03	00:21	Sensors are coming up but not at a steady reading yet.	21.32513	144.19161	410	165	S5K10522.jpg
2016-12-03	00:22	There are 10 camera views coming up from <i>SuBastian</i> .	21.32513	144.19160	410	165	S5K10548.jpg
2016-12-03	00:23	Sensors not quite stabilized yet.	21.32513	144.19161	410	165	
2016-12-03	00:23	Wand tip is rising up about a cm while taking sensor readings.	21.32513	144.19161	410	165	
2016-12-03	00:24	pH=7.1 O2=4.00 ml/l Temp=13.3deg. just above the sediment surface.	21.32513	144.19161	410	165	S5K10654.jpg
2016-12-03	00:24	Stowing HFS wand again.	21.32513	144.19161	410	165	S5K10704.jpg
2016-12-03	00:26	Picking up fish trap.	21.32513	144.19161	410	166	S5K10822.jpg
2016-12-03	00:27	Want to deploy the trap on a darker sediment location.	21.32513	144.19161	410	165	S5K10871.jpg
2016-12-03	00:28	HFS sensors will be running while moving around to place the fish trap.	21.32513	144.19161	410	165	
2016-12-03	00:29	Moving away from the smoke. There is the smoking pit ahead of us.	21.32511	144.19158	409	166	S5K10964.jpg
2016-12-03	00:30	Small pit in front of us.	21.32505	144.19155	407	168	S5K11058.jpg
2016-12-03	00:31	Too close to the smoking pit.	21.32502	144.19156	407	169	S5K11118.jpg
2016-12-03	00:32	Going to head back to where we started the dive for good visibility and darker substrate. That position is almost due north.	21.32503	144.19157	407	168	S5K11148.jpg
2016-12-03	00:32	ROV is turning clockwise to head back to the location.	21.32506	144.19156	407	265	S5K11186.jpg
2016-12-03	00:33	Very smoky on the way there.	21.32509	144.19150	407	26	
2016-12-03	00:33	Cleared the smoke a bit.	21.32513	144.19153	404	50	S5K11245.jpg
2016-12-03	00:34	Lots of smoke off the back end of the ROV.	21.32516	144.19164	409	54	
2016-12-03	00:35	Aiming for the dark patch of surface below.	21.32520	144.19173	413	73	S5K11335.jpg
2016-12-03	00:35	Looks more rocky here. Could be a debris flow.	21.32522	144.19172	415	80	S5K11372.jpg
2016-12-03	00:37	Small pit.	21.32517	144.19178	411	152	S5K11476.jpg
2016-12-03	00:38	Actually that is a large chunk of something.	21.32515	144.19179	409	141	S5K11497.jpg
2016-12-03	00:38	Lots of fish on the light sediments. Seeing some on the dark sediment as we get closer.	21.32510	144.19182	408	142	S5K11531.jpg
2016-12-03	00:40	Fish are not as dense as before.	21.32506	144.19186	408	150	S5K11618.jpg
2016-12-03	00:40	Moving further upslope.	21.32505	144.19186	408	147	S5K11643.jpg
2016-12-03	00:41	This site looks sufficient for placing the trap. Will land here.	21.32503	144.19188	406	147	1480725677837S5K11692.jpg
2016-12-03	00:42	Close-up of the site.	21.32503	144.19188	407	151	S5K11737.jpg
2016-12-03	00:42	Putting the trap off to the right of the dark patch of sediment for now.	21.32503	144.19187	407	151	S5K11755.jpg
2016-12-03	00:43	Placing trap on surface.	21.32503	144.19187	407	150	S5K11804.jpg
2016-12-03	00:43	Pushing the trap down into the sediment.	21.32503	144.19187	407	150	S5K11817.jpg
2016-12-03	00:43	DEPLOY: Fish Trap Black-tape. On darker sediment edge next to the white sediment.	21.32503	144.19187	407	150	S5K11839.jpg
2016-12-03	00:45	Going to deploy the second trap here as well.	21.32503	144.19187	407	150	S5K11915.jpg
2016-12-03	00:45	Highlights on. <i>SuBastian</i> deploying 2nd fish trap.	21.32503	144.19187	407	150	S5K11928.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	00:47	Second fish trap will be the Yellow trap.	21.32503	144.19187	407	149	S5K12035.jpg
2016-12-03	00:48	Placing the Yellow second trap as far as ROV can reach from this site.	21.32503	144.19187	407	149	S5K12136.jpg
2016-12-03	00:48	Other fish in view in water column, top left.	21.32503	144.19187	407	149	S5K12144.jpg
2016-12-03	00:50	Arm malfunction.	21.32503	144.19187	407	148	S5K12218.jpg
2016-12-03	00:50	Highlights off.	21.32503	144.19187	407	148	
2016-12-03	00:51	DEPLOY Yellow Fish Trap. Next to the Black Fish Trap.	21.32503	144.19187	407	147	S5K12291.jpg
2016-12-03	00:52	Yellow fish trap is more centered on the darker sediment and the black-tape trap is in the darker sediment but closer to the lighter sediment.	21.32503	144.19187	407	148	S5K12339.jpg
2016-12-03	00:53	Yellow trap has cat food that has been sitting on the deck for a day in the heat of brand X. Black trap has fresh food of brand Y.	21.32503	144.19188	407	148	S5K12442.jpg
2016-12-03	00:54	Fish are not very active.	21.32503	144.19188	407	147	
2016-12-03	00:55	Sensor background readings of pH=8.4 O2=4.27 ml/l Temperature is 13.6deg.	21.32503	144.19188	407	147	S5K12521.jpg
2016-12-03	00:55	Preparing to take some more HFS samples. We are about 4m east of the Fish Spa waypoint. A marker will be deployed after sampling.	21.32503	144.19188	407	147	S5K12571.jpg
2016-12-03	00:56	Maybe just 3m east of the waypoint.	21.32503	144.19188	407	147	
2016-12-03	00:57	First measurement will be just above the surface.	21.32503	144.19188	407	147	S5K12656.jpg
2016-12-03	00:57	Sensors are still running and checking to see if readings are different just above the surface now.	21.32503	144.19188	407	148	S5K12685.jpg
2016-12-03	00:58	Sulfur tadpoles and fish just next to intake.	21.32503	144.19188	407	148	S5K12721.jpg
2016-12-03	00:59	Flush pump is running to clear it out.	21.32503	144.19188	407	148	
2016-12-03	00:59	Now the flush pump is off and sensors will be checked. So far it looks identical to background.	21.32503	144.19188	407	148	S5K12796.jpg
2016-12-03	01:00	Not seeing any change.	21.32503	144.19188	407	147	
2016-12-03	01:01	Water just above the sediment is the same as the ambient water.	21.32503	144.19188	407	147	S5K12888.jpg
2016-12-03	01:01	Lowering wand time a few cm into the sediment.	21.32503	144.19188	407	147	
2016-12-03	01:01	Tip is approximately halfway down into the sediment.	21.32503	144.19188	407	147	S5K12933.jpg
2016-12-03	01:03	Flush pump is on with wand in sediment.	21.32503	144.19188	407	147	S5K13009.jpg
2016-12-03	01:03	Sediment is not warm here. Has a lower pH.	21.32503	144.19188	407	147	S5K13043.jpg
2016-12-03	01:05	Stopping the flush pump.	21.32503	144.19188	407	147	
2016-12-03	01:07	Trying to retrieve the ROV temperature probe from the basket.	21.32503	144.19188	407	147	S5K13260.jpg
2016-12-03	01:08	This location is further away from the sulfur pit but at about the same depth.	21.32503	144.19188	407	147	
2016-12-03	01:08	Sensors are starting to stabilize with flush pump off. pH=8.11 O2=3.5 ml/l Just slightly different than the background seawater.	21.32503	144.19188	407	147	
2016-12-03	01:09	Temp is 13.4deg.	21.32503	144.19188	407	147	
2016-12-03	01:10	Going to pull the wand tip up slightly out of the sediment. About an inch higher but still in the sediment.	21.32503	144.19188	407	146	
2016-12-03	01:11	Fish are not as active here and there is not much heat coming out here.	21.32503	144.19188	407	146	
2016-12-03	01:12	HD new file started.	21.32503	144.19188	407	146	

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	01:12	No change with the HFS sensors when the wand tip was brought up about an inch.	21.32503	144.19188	407	146	
2016-12-03	01:14	Grabbing the temperature probe.	21.32503	144.19188	407	146	S5K13670.jpg
2016-12-03	01:15	Putting wand tip into the sediment up to the bend.	21.32503	144.19188	407	145	S5K13735.jpg
2016-12-03	01:16	ROV probe is reading 13.48deg which is the same as the HFS probe.	21.32503	144.19188	407	145	S5K13788.jpg
2016-12-03	01:16	Relocating the probe halfway between the last point and closer to the HFS wand.	21.32503	144.19188	407	145	S5K13817.jpg
2016-12-03	01:17	Second temperature reading site.	21.32503	144.19188	407	145	S5K13844.jpg
2016-12-03	01:17	Temperature is the same at this location at 13.48deg.	21.32503	144.19188	407	145	S5K13865.jpg
2016-12-03	01:18	Taking temperature of the water a few feet above the bottom.	21.32503	144.19188	407	145	S5K13926.jpg
2016-12-03	01:18	Temperature is the same.	21.32503	144.19188	407	145	S5K13948.jpg
2016-12-03	01:19	S35-HFS-07 Start 01:19. Unfiltered Bag #18. In ambient temperature sediment approximately 30m east of the waypoint at Fish Spa. Can see exhaust.	21.32503	144.19188	407	145	S5K14009.jpg
2016-12-03	01:22	No crabs observed here and the fish are not very active.	21.32503	144.19188	407	144	
2016-12-03	01:23	S35-HFS-07 Stop. Tmax=13.5 Tavg=13.4 vol=500 T2=13.6	21.32503	144.19188	407	144	S5K14196.jpg
2016-12-03	01:24	S35-HFS-08 Start 01:24 Filtered Bag #19. At same location.	21.32503	144.19187	407	144	S5K14260.jpg
2016-12-03	01:25	Location is about 30m east of Fish Spa waypoint1.	21.32503	144.19188	407	144	S5K14344.jpg
2016-12-03	01:26	S35-HFS-08 Stop 01:26. Tmax=13.6 Tavg=13.5 vol=500 T2=13.7	21.32503	144.19188	407	144	S5K14432.jpg
2016-12-03	01:28	Next will be trying to suction collect some fish.	21.32503	144.19188	407	144	S5K14531.jpg
2016-12-03	01:28	HFS and ROV temperature probes are measuring the same.	21.32503	144.19188	407	144	S5K14547.jpg
2016-12-03	01:30	Stowing the HFS wand.	21.32503	144.19187	407	144	S5K14618.jpg
2016-12-03	01:32	HFS sensors will be on.	21.32503	144.19187	407	143	S5K14768.jpg
2016-12-03	01:33	ROV telemetry has been creating some issues with the manipulators.	21.32503	144.19187	407	143	
2016-12-03	01:33	Sensors will be running.	21.32503	144.19187	407	143	
2016-12-03	01:34	Going to attempt to suction fish into chamber 6 or 7. 2mm mesh jars.	21.32503	144.19187	407	143	
2016-12-03	01:35	Chamber is at 8 currently.	21.32503	144.19187	407	143	
2016-12-03	01:36	Moved to chamber #7.	21.32503	144.19187	407	143	S5K15007.jpg
2016-12-03	01:37	Suction is on.	21.32503	144.19187	407	143	S5K15035.jpg
2016-12-03	01:40	Still suctioning but no fish yet.	21.32503	144.19187	407	144	S5K15229.jpg
2016-12-03	01:42	Not so many fish in this area as yesterday.	21.32503	144.19188	407	144	S5K15365.jpg
2016-12-03	01:43	Not going to attempt to slurp here as it is not working with the lower density of fish.	21.32503	144.19188	407	143	S5K15443.jpg
2016-12-03	01:44	Plan to deploy a marker here and retrieve one of the fish traps. Will return to pick up the trap left with the marker.	21.32503	144.19188	407	143	S5K15481.jpg
2016-12-03	01:45	S35-Bio-09 Suction sample of sediment near fish trap deployment 30m east of Fish Spa. Sample is in chamber #7.	21.32503	144.19188	407	143	S5K15549.jpg
2016-12-03	01:47	Suction jars were indexed so sediment will stay in the jar.	21.32503	144.19188	407	143	
2016-12-03	01:47	Grabbed Mkr-133 to deploy at this site.	21.32503	144.19188	407	143	S5K15684.jpg
2016-12-03	01:48	Unfurling the marker.	21.32503	144.19188	407	143	S5K15722.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	01:49	DEPLOY Mkr-133 at Fish trap site.	21.32503	144.19188	407	143	S5K15773.jpg
2016-12-03	01:51	RECOVER Yellow fish trap (no fish inside for redeployment at another location).	21.32503	144.19188	407	143	S5K15876.jpg
2016-12-03	01:53	Deciding the next plan. Will head to waypoint #2 on the south rim of the large pit of Daikoku. ROV needs to take a wrap out of its tether.	21.32503	144.19188	407	141	S5K16049.jpg
2016-12-03	01:55	Pulling away from this site.	21.32503	144.19188	406	142	S5K16162.jpg
2016-12-03	01:56	Murky view of Mkr-133.	21.32503	144.19186	406	115	S5K16179.jpg
2016-12-03	01:56	Will be traveling uphill to the south rim of the large crater.	21.32504	144.19188	406	61	S5K16199.jpg
2016-12-03	01:57	Taking the turn out of the tether.	21.32497	144.19187	404	309	
2016-12-03	01:57	Nice crack in the slope.	21.32496	144.19182	403	241	S5K16261.jpg
2016-12-03	01:57	Heading south but the water is too murky to see.	21.32491	144.19181	396	194	
2016-12-03	01:58	Moving upslope. Observing a lot of fish on sediment here.	21.32485	144.19179	395	193	S5K16320.jpg
2016-12-03	01:59	Waypoint is 100m bearing 161 from current location.	21.32474	144.19175	392	174	S5K16381.jpg
2016-12-03	02:00	Crust of sulfur on the slope.	21.32467	144.1917	390.6	124	S5K16425.jpg
2016-12-03	02:01	Lots of fish here.	21.32455	144.1918	386	101	S5K16498.jpg
2016-12-03	02:01	Crabs in the sulfur crusts.	21.32453	144.1918	384.9	101	S5K16513.jpg
2016-12-03	02:01	Many fish here. Navigation marker being put here.	21.32452	144.1918	383.8	102	S5K16528.jpg
2016-12-03	02:02	Lots of Fish waypoint.	21.32449	144.1918	382.7	101	S5K16560.jpg
2016-12-03	02:03	HD new file started.	21.3243	144.1919	377.2	98.5	S5K16653.jpg
2016-12-03	02:04	Ripples in the sediment indicating more current.	21.32426	144.1919	374.7	89.8	S5K16693.jpg
2016-12-03	02:05	Lots of fish!	21.32424	144.1919	373.6	86.6	S5K16717.jpg
2016-12-03	02:06	Caldera rim in the distance?	21.32421	144.192	372.5	88.9	S5K16774.jpg
2016-12-03	02:06	Lots of ripples from current sweeping over the top.	21.32422	144.192	370.4	89.8	S5K16818.jpg
2016-12-03	02:07	Going to deploy fish trap as lots on this slope.	21.32421	144.192	370.1	87.5	S5K16868.jpg
2016-12-03	02:09	Reaching for the fish trap.	21.32422	144.1921	371.4	88.2	S5K16990.jpg
2016-12-03	02:10	Fish trap out of the bio box.	21.32422	144.1921	371.4	87.9	S5K17073.jpg
2016-12-03	02:11	Repositioning fish trap.	21.32422	144.1921	371.4	87.1	S5K17133.jpg
2016-12-03	02:12	DEPLOY. Yellow-tape fish trap. Will put marker out.	21.32422	144.1921	371.4	87	S5K17167.jpg
2016-12-03	02:13	Going to deploy Mkr 137. Plume coming around us now.	21.32422	144.1921	371.3	84.6	S5K17253.jpg
2016-12-03	02:15	DEPLOY. Marker 137. By yellow fish trap, about 50m N of waypoint 2.	21.32422	144.1921	371.4	84.5	S5K17337.jpg
2016-12-03	02:18	Heading towards waypoint 2.	21.32421	144.1921	370.7	87.7	S5K17533.jpg
2016-12-03	02:19	Going to edge of crater and then heading S to waypoint 2. Thick plume.	21.32417	144.1921	367.7	83.8	S5K17604.jpg
2016-12-03	02:20	Heading S now.	21.32413	144.1922	369.8	88	1480731627912S5K17642.jpg
2016-12-03	02:22	Very thick plume.	21.3241	144.1921	369.1	141	S5K17752.jpg
2016-12-03	02:22	Some rocks visible on the arm camera.	21.32403	144.1921	368.1	145	S5K17781.jpg
2016-12-03	02:25	Seeing bottom again.	21.32391	144.1922	369.5	146	S5K17922.jpg
2016-12-03	02:25	Looking at the inner wall of the big crater at Daikoku.	21.32387	144.1922	367.8	147	S5K17972.jpg
2016-12-03	02:26	Can see a few tubeworms in the rock edges.	21.32385	144.1922	363.8	145	S5K18004.jpg
2016-12-03	02:27	Tubeworms.	21.32386	144.1922	362.1	146	S5K18038.jpg
2016-12-03	02:27	Putting a navigational marker here at this clump of tubeworms.	21.32385	144.1923	362.5	146	S5K18049.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	02:27	Coming up higher to get to the top of the rim.	21.32386	144.1923	361.6	145	S5K18085.jpg
2016-12-03	02:28	Here is the rim.	21.32384	144.1923	359.2	140	S5K18111.jpg
2016-12-03	02:28	Going to lateral right to get to the waypoint.	21.32384	144.1923	358.9	139	S5K18121.jpg
2016-12-03	02:33	Wall of layered crust by rocky outcrop.	21.3238	144.1922	356.7	167	S5K18413.jpg
2016-12-03	02:34	Flatfish; anemones on the wall and some sulfur.	21.32377	144.1922	356.2	138	S5K18481.jpg
2016-12-03	02:35	Nice pic of rocky outcrop.	21.32379	144.1922	356.5	158	S5K18558.jpg
2016-12-03	02:36	Same rocky outcrop.	21.3238	144.1922	356.2	160	S5K18585.jpg
2016-12-03	02:36	South "Wall" in the distance.	21.32381	144.1922	357	161	S5K18606.jpg
2016-12-03	02:37	Tubeworms on outcrop walls.	21.32379	144.1922	355.4	158	S5K18663.jpg
2016-12-03	02:37	Can see a cluster down the wall. Very smoky here.	21.32379	144.1922	354.8	158	S5K18667.jpg
2016-12-03	02:38	Approaching the vertical cliff from the inside of the crater and trying to find a good sample of tubeworms.	21.32384	144.1922	359.8	162	S5K18722.jpg
2016-12-03	02:39	Tubeworm possibility.	21.32383	144.1923	359.7	161	S5K18775.jpg
2016-12-03	02:39	These worms do have red tips and should be a good sample.	21.32383	144.1923	359.8	161	S5K18792.jpg
2016-12-03	02:42	Going to try to sample the worms with the ROV hovering.	21.32383	144.1923	359.5	147	S5K18945.jpg
2016-12-03	02:42	Highlights on for tubeworm sampling.	21.32383	144.1923	359.8	149	S5K18954.jpg
2016-12-03	02:43	Bringing out the front porch to stabilize the vehicle.	21.32383	144.1923	359.3	141	S5K19029.jpg
2016-12-03	02:44	Wall is not that stable.	21.32383	144.1923	359	139	S5K19086.jpg
2016-12-03	02:45	Highlights off.	21.32382	144.1923	359.1	140	S5K19139.jpg
2016-12-03	02:46	Looking for the best approach to sample the worms on the vertical wall.	21.32382	144.1923	358.2	137	S5K19205.jpg
2016-12-03	02:47	Moving starboard to see if those worms can be approached.	21.32382	144.1923	357.9	139	S5K19249.jpg
2016-12-03	02:51	HFS sensors are back on.	21.32378	144.1923	354.7	138	S5K19500.jpg
2016-12-03	02:51	Trying to sample the worms.	21.32378	144.1923	354.8	137	S5K19516.jpg
2016-12-03	02:52	S35-Bio-10 Sample of about 8 tubeworms. Taken from the inside wall of the big crater near the rim. In the area of waypoint #2 (20m east and 5m north of <i>Okeanos</i> site).	21.32378	144.1923	354.8	137	S5K19574.jpg
2016-12-03	02:54	Adding 2 more worms to the sample.	21.32378	144.1923	354.8	137	S5K19677.jpg
2016-12-03	02:55	Samples are in the forward-port biobox. Trying to add 2-3 more tubeworms to the sample.	21.32378	144.1923	354.8	137	S5K19729.jpg
2016-12-03	02:56	Grabbed several more worms and placing them in the biobox.	21.32378	144.1923	354.9	137	S5K19827.jpg
2016-12-03	02:57	Speculate they are feeding off the plume coming out of the crater as there is no observable flow at their location.	21.32378	144.1923	355	136	S5K19867.jpg
2016-12-03	02:58	Biobox is closing. One tube is partially out of the box.	21.32377	144.1923	355	136	S5K19922.jpg
2016-12-03	02:59	Going to attempt to take HFS sensor readings here.	21.32378	144.1923	355	136	S5K19985.jpg
2016-12-03	03:02	HD new file started.	21.32378	144.1923	355	138	S5K20170.jpg
2016-12-03	03:03	Preparing to take HFS sensor readings inside the tubeworm clump.	21.32378	144.1923	355	139	S5K20253.jpg
2016-12-03	03:05	Retrieving the HFS wand.	21.32378	144.1923	355	137	S5K20325.jpg
2016-12-03	03:06	Trying to put it in a crevice of the rocks.	21.32378	144.1923	355	138	S5K20381.jpg
2016-12-03	03:06	The ambient water is murky so in a plume of something.	21.32378	144.1923	355	137	S5K20412.jpg
2016-12-03	03:07	Going to take 2 HFS bag samples here.	21.32377	144.1923	355	137	S5K20476.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	03:09	S35-HFS-11 Start 03:09. Unfiltered Bag #20. Taken at the same location as the tubeworm sample. In a crack at the base of the worms. Inside the crater wall.	21.32379	144.1923	355	139	
2016-12-03	03:11	Anemones are living on the outside of the tubeworm casing.	21.32379	144.1923	354.9	139	S5K20725.jpg
2016-12-03	03:12	S35-HFS-11 Stop 03:13. Tmax=15.7 Tavg=15.6 vol=501 T2=15.7. Vehicle moved just at end of the sample.	21.32379	144.1923	354.8	140	S5K20762.jpg
2016-12-03	03:13	Pulled off the wall.	21.32376	144.1923	348.2	144	S5K20840.jpg
2016-12-03	03:14	Highlights of tubeworm. 03:10 to 03:12.	21.32376	144.1923	346.9	160	S5K20859.jpg
2016-12-03	03:17	Tubeworm from biobox floating in the foreground.	21.32375	144.1923	347.6	196	S5K21075.jpg
2016-12-03	03:22	Lots S on rocky outcrop.	21.3239	144.1923	357	198	S5K21387.jpg
2016-12-03	03:23	Still in the approximate same area as the tubeworm sample.	21.32388	144.1923	357.1	198	S5K21408.jpg
2016-12-03	03:25	Highlights on	21.32386	144.1923	362	197	
2016-12-03	03:26	Highlights on. Filming tubeworms.	21.32386	144.1923	362.4	197	1480735561840S5K21576.jpg
2016-12-03	03:27	Shrimp hiding in the back of the tubes. Probably can't see it on the frame grab.	21.32385	144.1923	362.5	197	S5K21644.jpg
2016-12-03	03:27	There is some ash coating the tubeworms and rocks.	21.32385	144.1923	361.7	198	S5K21652.jpg
2016-12-03	03:28	Ship is yanking on the vehicle.	21.32385	144.1923	361.4	197	1480735692934S5K21707.jpg
2016-12-03	03:28	Slightly matted rocks?	21.32385	144.1923	361.5	197	S5K21723.jpg
2016-12-03	03:28	Fish in tubes on left and exposed S behind.	21.32385	144.1923	362.2	197	S5K21750.jpg
2016-12-03	03:28	Fish in between tubes.	21.32385	144.1923	362.3	197	S5K21751.jpg
2016-12-03	03:29	Fish.	21.32385	144.1923	363.1	197	S5K21803.jpg
2016-12-03	03:32	Crab on bottom right.	21.32385	144.1923	363	197	S5K21991.jpg
2016-12-03	03:32	Crab bottom right.	21.32385	144.1923	363	197	S5K21993.jpg
2016-12-03	03:34	Definite coating of ash here.	21.32385	144.1923	362.1	197	S5K22052.jpg
2016-12-03	03:35	Done with visual observations here.	21.32385	144.1923	363.1	197	S5K22118.jpg
2016-12-03	03:35	Highlights off.	21.32385	144.1923	363.7	197	
2016-12-03	03:35	Highlights off.	21.32385	144.1923	363.8	197	S5K22138.jpg
2016-12-03	03:37	Will be heading to white smoker at waypoint 3.	21.32386	144.1923	361.8	168	S5K22273.jpg
2016-12-03	03:38	Moving through the plume now.	21.32384	144.1923	359	74.9	S5K22326.jpg
2016-12-03	03:40	Still moving NE to waypoint 3. In thick plume.	21.32398	144.1924	372.4	145	S5K22465.jpg
2016-12-03	03:41	Rocky wall visible.	21.32392	144.1925	376	170	S5K22517.jpg
2016-12-03	03:44	Steep outcrop.	21.32386	144.1925	370.5	184	S5K22654.jpg
2016-12-03	03:45	Sonar is showing an indentation in the crater.	21.32382	144.1925	366.4	236	S5K22747.jpg
2016-12-03	03:46	Circling counterclockwise around the inside of the crater.	21.32383	144.1925	362.7	188	S5K22795.jpg
2016-12-03	03:50	Driving by the sonar display on the inside of the crater.	21.32381	144.1925	363.3	188	S5K23055.jpg
2016-12-03	03:54	Going out to the center of the crater and driving over to the waypoint. Will not see much on the cameras while transiting.	21.32376	144.1926	355.2	77.1	S5K23268.jpg
2016-12-03	03:56	About halfway between waypoint 2 & 3.	21.32407	144.1928	362	126	S5K23386.jpg
2016-12-03	03:59	Still transiting across the crater in midwater.	21.32404	144.193	389	107	
2016-12-03	04:01	No visibility with the wall 8m ahead. No altimeter.	21.32406	144.1931	394.5	106	

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	04:02	No visibility with wall right in front of us.	21.32407	144.1931	396.4	98.8	S5K23763.jpg
2016-12-03	04:03	Can't work here with no visibility. Must come up to the depth of the rim and then transit back to the pick up the fish trap.	21.32411	144.1932	395.9	112	S5K23822.jpg
2016-12-03	04:05	About 3 more hours left on this dive. ROV is coming straight up and then will transit over to fish traps.	21.32418	144.193	391.3	140	
2016-12-03	04:08	HD new file started.	21.3242	144.1925	344.5	264	
2016-12-03	04:12	Marker in site! Mkr-137 and the yellow fish trap.	21.32422	144.1922	366	281	S5K24348.jpg
2016-12-03	04:12	Found Mkr 137.	21.32421	144.1921	368.8	283	S5K24371.jpg
2016-12-03	04:16	Preparing to land to retrieve the fish trap near Mkr-137.	21.32419	144.192	366.5	33.2	S5K24582.jpg
2016-12-03	04:17	Being pulled up by the umbilical to the ship.	21.32421	144.1921	367.7	57.3	S5K24667.jpg
2016-12-03	04:19	Doesn't look like any fish in the trap.	21.3242	144.1921	370.9	58.1	S5K24799.jpg
2016-12-03	04:21	Lots of fish around the trap.	21.3242	144.1921	371	55.7	S5K24924.jpg
2016-12-03	04:22	RECOVER Fish trap yellow at Mkr-137. No fish in the trap.	21.3242	144.192	371	55.5	
2016-12-03	04:23	Plenty of fish around the trap but none went in the trap.	21.32423	144.1921	371	55.1	S5K25046.jpg
2016-12-03	04:25	Currents must get high in this area to create the patterns in the sediment.	21.3242	144.1921	371	55	S5K25141.jpg
2016-12-03	04:26	Retrieving the blue scoop from the basket. Preparing to scoop some sediment.	21.3242	144.1921	371	54.9	S5K25198.jpg
2016-12-03	04:27	S35-Bio-12 Scoop of sediment near the recovered (but empty) fish trap and Mkr-137. Taking several swipes with the sediment scoop.	21.32421	144.1921	370.9	54.5	
2016-12-03	04:29	Taking a second scoop.	21.32421	144.1921	370.9	54.1	S5K25368.jpg
2016-12-03	04:29	A non-vent red fish in the vicinity as well.	21.3242	144.1921	371	54.1	S5K25396.jpg
2016-12-03	04:30	Looks good. Will place in the large biobox. End sample.	21.3242	144.1921	370.9	54.1	S5K25423.jpg
2016-12-03	04:32	Placing sample on the seafloor to pull out the fish trap since it will need to be used later.	21.32421	144.1921	371	54	S5K25577.jpg
2016-12-03	04:33	More basket management with removing the fish trap from the biobox.	21.32421	144.1921	371	54	S5K25609.jpg
2016-12-03	04:34	Picking up the scoop again and putting it in the biobox.	21.3242	144.1921	371	54	S5K25664.jpg
2016-12-03	04:35	Twirling the net to make it smaller.	21.3242	144.1921	371	53.8	S5K25745.jpg
2016-12-03	04:36	The scoop has landed into the biobox!	21.32421	144.1921	371	53.8	S5K25826.jpg
2016-12-03	04:37	Retrieved the fish trap again and now will place it on top of the sediment scoop.	21.32421	144.1921	371	53.8	S5K25864.jpg
2016-12-03	04:38	Yellow fish trap is in the biobox.	21.32421	144.1921	371	53.8	
2016-12-03	04:39	Biobox is closed.	21.32421	144.192	371	53.9	S5K25965.jpg
2016-12-03	04:39	Next heading to the black fish trap location downslope from here and to the north.	21.32421	144.192	371	53.9	
2016-12-03	04:41	Lots of fish when lifted off bottom.	21.32426	144.1921	371.2	28.3	S5K26098.jpg
2016-12-03	04:42	Neat crusts in the sediment.	21.32431	144.1921	371.8	338	S5K26180.jpg
2016-12-03	04:42	Sediment and relatively flat surface.	21.32431	144.1921	371.8	338	S5K26181.jpg
2016-12-03	04:44	Fish covered top of ridge.	21.32436	144.192	371.5	335	S5K26272.jpg
2016-12-03	04:44	Fish seem to be moving around more here.	21.32436	144.192	371.5	335	S5K26275.jpg
2016-12-03	04:44	Looked like we were on a local ridge.	21.32438	144.192	371.8	335	S5K26308.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	04:45	Nice little ridge.	21.32439	144.192	372	334	S5K26331.jpg
2016-12-03	04:45	Moving downslope with thicker white sediment.	21.32442	144.192	372.5	335	S5K26357.jpg
2016-12-03	04:47	Significant patches of white sediment (local patches).	21.32452	144.192	378.9	329	S5K26462.jpg
2016-12-03	04:47	Some whiter patches.	21.32452	144.192	379	326	S5K26465.jpg
2016-12-03	04:48	Crusty places of sulfur here.	21.32459	144.192	381.2	341	S5K26532.jpg
2016-12-03	04:48	Big plume ahead.	21.32461	144.192	382.5	340	S5K26546.jpg
2016-12-03	04:49	Nice view of edge of sulfur crust and plume behind.	21.32463	144.192	384.7	339	S5K26580.jpg
2016-12-03	04:50	Broken plates of crust.	21.32468	144.1919	387	340	S5K26618.jpg
2016-12-03	04:50	Large piece of crust caved into pit with smoking vent.	21.32469	144.1919	388.2	343	S5K26635.jpg
2016-12-03	04:50	Plume coming up where something fell.	21.32469	144.1919	388.2	344	S5K26634.jpg
2016-12-03	04:51	Massive slabs of sulfur.	21.32473	144.1919	389.1	340	S5K26684.jpg
2016-12-03	04:51	S crust exposed ledge.	21.32478	144.1919	392.9	331	S5K26721.jpg
2016-12-03	04:51	Good view of sulfur crust edges.	21.32479	144.1919	394.3	323	S5K26733.jpg
2016-12-03	04:52	Altimeter is back.	21.32482	144.1919	394.9	313	S5K26777.jpg
2016-12-03	04:53	Into the plume.	21.3249	144.1919	398.7	313	S5K26841.jpg
2016-12-03	04:53	Buoyant sulfur bubble and lots of smoke.	21.3249	144.1919	398.8	313	S5K26845.jpg
2016-12-03	04:54	Flying above the plume on the way to the fish trap.	21.32492	144.1919	401.2	342	S5K26876.jpg
2016-12-03	04:55	Can see a lot of fish below us in the bottom camera.	21.32495	144.1919	404	351	
2016-12-03	04:55	Mkr 133 in sight.	21.32496	144.1919	404.1	352	S5K26939.jpg
2016-12-03	04:57	Plan is to put out the empty fish trap just recovered from marker 137 here at mkr 133 and pick both up at the end of the dive.	21.32499	144.1919	405.4	333	
2016-12-03	05:00	DEPLOY. Yellow fish trap by Mkr 133 while working here for a while.	21.32499	144.1919	405.4	331	S5K27224.jpg
2016-12-03	05:04	On the way to waypoint 1 to sample in the area from yesterday's dive with the Beast.	21.32502	144.1919	403.7	332	S5K27457.jpg
2016-12-03	05:04	Interesting block of sulfur.	21.32506	144.1919	407	342	S5K27490.jpg
2016-12-03	05:05	Chunky rocks of sulfur and sand.	21.32509	144.1918	408.8	270	S5K27542.jpg
2016-12-03	05:06	Lots of fish on the substrate.	21.32507	144.1918	408.8	268	S5K27608.jpg
2016-12-03	05:07	Flying along the bottom. Outcrops of darker material in the white sediment and patches of yellow sulfur.	21.32507	144.1917	408.5	268	S5K27635.jpg
2016-12-03	05:07	Want to sample downwind of the current to sample the fluids.	21.32509	144.1917	406.5	267	S5K27667.jpg
2016-12-03	05:07	Other fishes swimming by, right side.	21.32509	144.1917	406.3	265	S5K27671.jpg
2016-12-03	05:08	bubbles and fluids coming from cracks in the sediment.	21.32513	144.1917	408.5	223	S5K27737.jpg
2016-12-03	05:09	HD new file started.	21.32511	144.1917	408.6	221	
2016-12-03	05:09	Crabs and fish and warm water.	21.3251	144.1917	408.7	233	S5K27804.jpg
2016-12-03	05:10	Want to sample from the water coming from the crack. Crabs closer to the water than the fish again.	21.32509	144.1917	408.1	233	S5K27833.jpg
2016-12-03	05:11	Going to take some nice video of the site before sampling.	21.32509	144.1917	408.8	232	S5K27885.jpg
2016-12-03	05:11	Highlights on. Filming fissure with yellow S, bubbles, crabs, fish.	21.32509	144.1917	408.8	232	S5K27917.jpg
2016-12-03	05:12	Retrieving the HFS wand with a curtain of bubbles behind.	21.32509	144.1917	408.9	233	S5K27964.jpg
2016-12-03	05:13	HFS background readings of pH=8.24 O2=4.23 ml/l Temp=13.68.	21.32509	144.1917	408.9	232	S5K28047.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	05:14	HFS is too deep at that spot.	21.32509	144.1917	408.9	233	S5K28095.jpg
2016-12-03	05:16	Going to move the wand up into the crack.	21.32509	144.1917	408.9	233	S5K28175.jpg
2016-12-03	05:16	Highlights off.	21.32509	144.1917	408.9	233	S5K28176.jpg
2016-12-03	05:16	Not getting good readings where the wand was.	21.32509	144.1917	408.9	233	
2016-12-03	05:16	Want the wand tip in the smoke.	21.32509	144.1917	408.8	233	S5K28210.jpg
2016-12-03	05:17	Going to have to move forward.	21.32509	144.1917	408.9	233	S5K28241.jpg
2016-12-03	05:18	Maybe not far enough.	21.32509	144.1917	408.9	232	S5K28314.jpg
2016-12-03	05:19	Pump on. Checking to see if water is hot here.	21.32509	144.1917	408.9	232	S5K28360.jpg
2016-12-03	05:19	Not hot enough. Going to lower it down further.	21.32509	144.1917	408.9	233	S5K28404.jpg
2016-12-03	05:20	Still not hot enough. Only about 20deg so will need to move forward.	21.32509	144.1917	408.9	233	S5K28447.jpg
2016-12-03	05:22	Moved forward and trying another placement. Want it over the white smoke.	21.32508	144.1917	408.6	239	S5K28583.jpg
2016-12-03	05:23	Close-up of the placement. Pump is on and heat is coming up a bit.	21.32508	144.1917	408.6	239	S5K28623.jpg
2016-12-03	05:23	Smoking wand.	21.32508	144.1917	408.6	239	S5K28630.jpg
2016-12-03	05:24	Up to 33deg. here.	21.32508	144.1917	408.6	239	S5K28683.jpg
2016-12-03	05:24	Going to lower the intake a bit further.	21.32508	144.1917	408.6	239	S5K28695.jpg
2016-12-03	05:26	Only getting 28-30deg here.	21.32508	144.1917	408.6	239	S5K28776.jpg
2016-12-03	05:26	Now the plume is coming at us. Need to move over to another spot to find the 70deg water.	21.32508	144.1917	408.6	238	S5K28828.jpg
2016-12-03	05:28	Set down a bit lower to try other part of the venting area.	21.32511	144.1917	409.5	213	S5K28949.jpg
2016-12-03	05:29	Looking for hot water.	21.32511	144.1917	409.5	212	S5K28966.jpg
2016-12-03	05:29	Looks like more bubbles and less water than yesterday.	21.32511	144.1917	409.6	209	S5K28987.jpg
2016-12-03	05:30	Not over the smoke.	21.32511	144.1917	409.6	209	S5K29033.jpg
2016-12-03	05:30	Gauge reading.	21.3251	144.1917	409.6	209	S5K29049.jpg
2016-12-03	05:31	Looking at the smoky pit in the upper left.	21.3251	144.1917	409.6	209	S5K29126.jpg
2016-12-03	05:33	Going to reposition to get up by the yellow sulfur chimlets for hotter water.	21.32511	144.1917	409.6	209	S5K29251.jpg
2016-12-03	05:35	Moved around the crack and still looking	21.32511	144.1916	409.1	210	S5K29316.jpg
2016-12-03	05:37	Waiting for some visibility.	21.3251	144.1916	409.1	159	S5K29467.jpg
2016-12-03	05:39	No heat here.	21.3251	144.1916	409.1	159	S5K29564.jpg
2016-12-03	05:39	Think intake is on top of a sulfur chimlet.	21.3251	144.1916	409.1	159	S5K29588.jpg
2016-12-03	05:41	On top of a little sulfur chimney.	21.3251	144.1916	409.1	160	S5K29692.jpg
2016-12-03	05:44	Highlights on. Venting areas.	21.3251	144.1916	409.1	162	
2016-12-03	05:44	Flush pump is not running and temp is 42.2deg.	21.3251	144.1916	409.1	162	S5K29906.jpg
2016-12-03	05:49	S35-HFS-13 Start 05:49. Unfiltered Piston #4. At waypoint 1 site Fish Spa.	21.3251	144.1916	409.1	164	S5K30170.jpg
2016-12-03	05:50	While waiting to start the sample, the current has shifted and the background plume is now going straight up instead of to the left of the ROV.	21.3251	144.1916	409.1	165	S5K30271.jpg
2016-12-03	05:51	Flush pump not running.	21.32509	144.1916	409.1	165	
2016-12-03	05:52	Stop 05:52. Tmax=42.3 Tavg=36.1 vol=480 T2=14.	21.3251	144.1916	409.1	165	
2016-12-03	05:52	Turning the flush pump on in bursts.	21.3251	144.1916	409.1	164	S5K30393.jpg

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	05:53	S35-HFS-14 Start 05:53. Unfiltered Piston #8 Titanium. At same location.	21.3251	144.1916	409.1	164	S5K30427.jpg
2016-12-03	05:54	Flush pump is not running during the sample.	21.3251	144.1916	409.1	164	
2016-12-03	05:56	Stop 05:56. Tmax=43.7 Tavg=28.4 vol=602 T2=14.	21.32508	144.1916	409.1	165	S5K30628.jpg
2016-12-03	05:58	S35-HFS-15 Start 05:58. LVB #24. At the same location.	21.3251	144.1916	409.1	165	S5K30748.jpg
2016-12-03	06:01	Blowing out sulfur marbles.	21.3251	144.1916	409.1	165	S5K30876.jpg
2016-12-03	06:02	Blasting out sulfur blobs. Highlights on.	21.3251	144.1916	409.1	165	S5K30942.jpg
2016-12-03	06:03	Orange sulfur are the fresh pieces that just erupted out of the venting fluid.	21.3251	144.1916	409.1	165	S5K31004.jpg
2016-12-03	06:05	Highlights off after great shot of molten S droplets being ejected from small chimney.	21.3251	144.1916	409.1	165	S5K31149.jpg
2016-12-03	06:07	HD new file started.	21.32509	144.1916	409.1	165	S5K31240.jpg
2016-12-03	06:08	Highlights on, then off right away. Plume came through.	21.3251	144.1916	409.1	165	
2016-12-03	06:09	Burst of gas bubbles while sampling.	21.3251	144.1916	409.1	165	S5K31376.jpg
2016-12-03	06:10	Smoke is now coming at us during this sample.	21.3251	144.1916	409.1	164	S5K31451.jpg
2016-12-03	06:13	Highlights on. Back to the molten S ejecta.	21.3251	144.1916	409.1	164	S5K31627.jpg
2016-12-03	06:15	Stop 06:15. Tmax=69.2 Tavg=45.9 vol=3800 T2=14.	21.3251	144.1916	409.1	164	
2016-12-03	06:16	S35-HFS-16 Start 06:16. RNA Filter #13. At same exact location.	21.3251	144.1916	409.1	164	S5K31794.jpg
2016-12-03	06:17	Watching the sulfur structure building.	21.3251	144.1916	409.1	164	S5K31875.jpg
2016-12-03	06:18	Tadpole maker.	21.3251	144.1916	409.1	164	S5K31899.jpg
2016-12-03	06:25	The sulfur & volcano; was just to the left of the sampler intake.	21.3251	144.1916	409.1	165	S5K32369.jpg
2016-12-03	06:28	It is the <i>Gandolphus</i> crab that we need to capture.	21.3251	144.1916	409.1	165	S5K32519.jpg
2016-12-03	06:29	Stop 06:29. Tmax=49.2 Tavg=33.2 vol=3000.	21.3251	144.1916	409.1	165	S5K32561.jpg
2016-12-03	06:30	Retrieving the HFS wand and then will hunt for crabs with the suction sampler.	21.3251	144.1916	409.2	165	S5K32627.jpg
2016-12-03	06:30	Highlights off. SUPER cool imagery of S finger chimney building.	21.3251	144.1916	409.2	165	S5K32636.jpg
2016-12-03	06:31	Stowing the HFS wand.	21.3251	144.1916	409.1	166	
2016-12-03	06:33	Wand is stowed.	21.3251	144.1916	409.1	166	S5K32817.jpg
2016-12-03	06:36	Got bungee on the HFS wand.	21.3251	144.1916	409.1	165	S5K33018.jpg
2016-12-03	06:37	Going to grab the suction hose to go crab hunting.	21.3251	144.1916	409.1	165	
2016-12-03	06:37	Going to lift up, back away and then go left for where larger quantities of crabs were spotted.	21.3251	144.1916	409.1	165	
2016-12-03	06:42	Down in the crack are a bunch of crabs.	21.32507	144.1916	406.8	171	S5K33388.jpg
2016-12-03	06:43	Crabs in a crack.	21.32505	144.1916	406.9	178	S5K33437.jpg
2016-12-03	06:46	Indexing sampler to 5.	21.32503	144.1916	408	171	
2016-12-03	06:47	Lost the bottom view.	21.32502	144.1916	407.7	161	S5K33660.jpg
2016-12-03	06:48	Starting to suction.	21.32502	144.1916	407.7	161	
2016-12-03	06:49	Attempting to suction crabs in limited visibility.	21.32503	144.1916	407.6	179	S5K33794.jpg
2016-12-03	06:51	There is a black crab-nope is it a shadow on the biobox.	21.32503	144.1916	407.7	181	S5K33929.jpg
2016-12-03	06:52	It really is a black crab.	21.32503	144.1916	407.7	179	S5K33962.jpg
2016-12-03	06:52	Did not have suction earlier but it is now on.	21.32503	144.1916	407.7	179	S5K33980.jpg
2016-12-03	06:53	Suctioning into chamber 4 now.	21.32503	144.1916	407.7	179	

Date	Time	S35 - Daikoku - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	06:54	Direct suction did not get the crab into the tube.	21.32503	144.1916	407.7	178	S5K34055.jpg
2016-12-03	06:55	Suction sampler is off.	21.32503	144.1916	407.7	178	
2016-12-03	06:55	Going to lift off and transit over to the fish traps.	21.32503	144.1916	407.7	178	S5K34154.jpg
2016-12-03	06:58	There is the marker and fish traps. Mkr-133.	21.32499	144.1918	399.1	75.1	S5K34338.jpg
2016-12-03	07:00	Two fish traps at Mkr-133.	21.32502	144.1919	405.3	113	S5K34415.jpg
2016-12-03	07:00	Black-tape fish trap is on the right and the yellow-tape fish trap is on the left.	21.32501	144.1919	406.3	107	S5K34441.jpg
2016-12-03	07:01	RECOVER Fish Trap. Black tape trap at Mkr-133. Does not appear to have any samples in the trap. Placed in the aft biobox.	21.32501	144.1919	406.6	91.5	S5K34482.jpg
2016-12-03	07:03	RECOVER Fish Trap. Yellow tape. No fish in the trap. Placed in the aft biobox.	21.32501	144.1919	406.6	95.6	S5K34606.jpg
2016-12-03	07:04	Biobox is not closing completely. Need to keep the sediment in the biobox so need the box to close completely.	21.32501	144.1919	406.6	96	S5K34698.jpg
2016-12-03	07:07	S35-Bio-17 Suction of a crab at the fluid sampling site near Fish Spa. Did not know the crab was in chamber #4 until recovering the fish traps. Location of sample was 21deg 19.5017 144deg 11.4962 408m of depth. (Correct this in the final log.)	21.32501	144.1919	406.7	95.8	S5K34868.jpg
2016-12-03	07:11	Looking for crabs.	21.32494	144.1919	402.2	220	S5K35077.jpg
2016-12-03	07:11	HD new file started.	21.32493	144.1919	402.6	275	S5K35102.jpg
2016-12-03	07:12	Heading back toward the pit looking for crabs.	21.32495	144.1919	402.2	278	
2016-12-03	07:12	Heading to the venting to find higher temperature sediment and crabs.	21.325	144.1918	401.9	262	S5K35185.jpg
2016-12-03	07:13	Lots of crabs here.	21.32503	144.1917	401.2	253	S5K35227.jpg
2016-12-03	07:14	Verified the suction is pulling into jar #5.	21.32501	144.1917	404.8	239	S5K35280.jpg
2016-12-03	07:15	Crabs.	21.32502	144.1916	406.6	232	S5K35334.jpg
2016-12-03	07:16	S35-Bio-18 Crab suction into chamber 5. Looks like some were suctioned into chamber.	21.32502	144.1916	406.6	235	S5K35379.jpg
2016-12-03	07:17	Looks like the suction got another one.	21.32502	144.1916	406.6	238	S5K35463.jpg
2016-12-03	07:17	Crabs are on a slab of sulfur about a meter from some bubbles and flow. Lots of cracks in the crust.	21.32502	144.1916	406.6	237	S5K35493.jpg
2016-12-03	07:19	Can see a crab at the top of the chamber fighting the suction into the jar.	21.32502	144.1917	406.6	236	
2016-12-03	07:21	Going to let the suction run in case any more crabs are in the hose.	21.32502	144.1917	406.6	236	
2016-12-03	07:21	Coming off the bottom as this dive is ending.	21.32501	144.1917	405.4	235	S5K35718.jpg
2016-12-03	07:24	Rotating the suction chamber to 6 to keep the crab in #5 of the suction sampler.	21.32479	144.1917	355	269	
2016-12-03	07:26	Material in suction jar #6 is from the same slurp of jar #5.	21.32484	144.1918	330.4	302	

Table 6.6-3 Dive S36 – Chamorro

Date	Time	S36 - Chamorro - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	23:49	Can see the bottom.	20.82140	144.70684	921	51	
2016-12-03	23:49	At the bottom approximately 40m SW of the waypoint 1.	20.82132	144.70677	928	60	

Date	Time	S36 - Chamorro - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-03	23:50	HD is not recording right now.	20.82136	144.70684	925	61	
2016-12-03	23:50	The surface looks like broken lava flows in the small crater on top of the seamount.	20.82139	144.70685	923	55	
2016-12-03	23:51	White patch ahead and looks like a vent.	20.82143	144.70693	919	72	
2016-12-03	23:51	These small chimneys do not look active.	20.82144	144.70702	918	83	
2016-12-03	23:52	Conversion to H264 is working.	20.82144	144.70701	918	71	
2016-12-03	23:52	We are now about 10m from the <i>Okeanos</i> waypoint.	20.82144	144.70701	918	72	
2016-12-03	23:53	Small white chimney has some shimmer and going to settle down here.	20.82142	144.70703	917	21	
2016-12-03	23:53	HD is recording, but we don't have control on the Ipad. Will reset during a quiet time.	20.82143	144.70704	917	4	
2016-12-03	23:55	Highlight on. Small white chimney venting shimmering fluids. First area on bottom.	20.82144	144.70707	919	353	
2016-12-03	23:55	Can see shrimp and some snails on the side of the chimney. Surrounding seafloor is broken up lavas. This is a sulfide mound.	20.82145	144.70707	920	5	
2016-12-03	23:56	Clear flow from the active chimney. <i>Okeanos</i> measured a high temperature of 48°C.	20.82146	144.70711	919	4	
2016-12-03	23:57	Can observe other chimneys in the background.	20.82148	144.70711	918	1	
2016-12-03	23:58	Seem to be a line of chimneys on the sulfide mound.	20.82148	144.70704	919	20	
2016-12-03	23:58	Shrimp was a non-vent species.	20.82149	144.70703	919	20	
2016-12-03	23:59	Settling at this vent to sample fluids with the Beast.	20.82147	144.70710	920	25	
2016-12-04	00:00	Closeup view of the snails on the chimney and there are scaleworms.	20.82147	144.70709	920	25	
2016-12-04	00:01	See scaleworm grazing on the hairy snail.	20.82147	144.70709	920	25	
2016-12-04	00:01	The white filament is bacteria on the chimney.	20.82143	144.70707	920	25	
2016-12-04	00:02	One crab was observed at the base.	20.82136	144.70704	920	24	
2016-12-04	00:03	There is a polychaete tube.	20.82134	144.70702	920	25	
2016-12-04	00:03	Some of the white material may be inorganic.	20.82135	144.70702	920	25	
2016-12-04	00:03	Zooming in on the crab hiding in the rock crevices.	20.82137	144.70705	920	25	
2016-12-04	00:04	ROV is still adjusting the tether so there is a bit of movement from the ship.	20.82138	144.70708	920	27	
2016-12-04	00:05	The snails are occupying a definite zone on the chimney. Some of the white is definitely mineral. Orange is probably iron.	20.82141	144.70706	920	27	1480809900018S5K00039.jpg
2016-12-04	00:06	Framegrabs are now working.	20.82143	144.70708	920	27	2016-12-04T00_06_02.828665_S5K.jpg
2016-12-04	00:07	Highlights off for now.	20.82142	144.70708	920	27	1480810039282S5K00178.jpg
2016-12-04	00:08	Chimney	20.82142	144.70708	920	27	1480810082022S5K00221.jpg
2016-12-04	00:09	admin test	20.82142	144.70706	920	26	1480810166897S5K00306.jpg
2016-12-04	00:10	Highlights on again.	20.82143	144.70706	920	25	1480810225003S5K00364.jpg
2016-12-04	00:10	Galatheid crab.	20.82143	144.70706	920	25	2016-12-04T00_10_23.813732_S5K.jpg
2016-12-04	00:10	Overview of first chimney.	20.82143	144.70706	920	25	2016-12-04T00_10_54.841239_S5K.jpg
2016-12-04	00:11	Going to use the ROV temperature probe to get some readings around this chimney.	20.82143	144.70706	920	25	S5K00449.jpg

Date	Time	S36 - Chamorro - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-04	00:12	Need to slightly reposition <i>SuBastian</i> to get the temperature probe to reach the top of the chimney.	20.82144	144.70708	920	25	2016-12-04T00_12_45.825206_S5K.jpg
2016-12-04	00:12	Highlights off.	20.82144	144.70708	920	25	1480810371944S5K00511.jpg
2016-12-04	00:15	Moving closer to the chimney.	20.82147	144.70702	920	25	2016-12-04T00_15_00.827849_S5K.jpg
2016-12-04	00:15	Slight overview of line of chimneys beyond the current site.	20.82147	144.70706	919	28	S5K00661.jpg
2016-12-04	00:17	Retrieving the temperature wand from the basket.	20.82147	144.70709	920	39	S5K00804.jpg
2016-12-04	00:18	Jason and Cody are currently driving and operating the ROV.	20.82147	144.70710	920	40	S5K00840.jpg
2016-12-04	00:19	Wand retrieved from the basket.	20.82148	144.70711	920	40	S5K00913.jpg
2016-12-04	00:20	Background temp was 4.32°C.	20.82148	144.70710	920	40	S5K00985.jpg
2016-12-04	00:21	So far high temp was 22°C.	20.82149	144.70710	920	40	2016-12-04T00_21_13.820626_S5K.jpg
2016-12-04	00:22	Salp floating by.	20.82149	144.70710	920	41	S5K01081.jpg
2016-12-04	00:23	Moving the tip around to find the highest temperature.	20.82149	144.70710	920	41	S5K01139.jpg
2016-12-04	00:23	High temp of 65°C.	20.82149	144.70710	920	41	2016-12-04T00_23_38.836535_S5K.jpg
2016-12-04	00:24	Putting the ROV temperature wand away and going to get a sample with the HFS.	20.82149	144.70710	920	41	S5K01236.jpg
2016-12-04	00:26	Going to obtain the sulfide sample with hopefully the animals on it.	20.82149	144.70710	920	41	2016-12-04T00_26_13.831592_S5K.jpg
2016-12-04	00:26	Winds have come up to 30kts so we have 10 minutes left.	20.82149	144.70711	920	40	2016-12-04T00_26_51.842979_S5K.jpg
2016-12-04	00:28	HD recording on now.	20.82147	144.70707	920	41	S5K01456.jpg
2016-12-04	00:30	Biobox AFT is open.	20.82146	144.70704	920	41	2016-12-04T00_30_00.820894_S5K.jpg
2016-12-04	00:30	S36-Geo-01. Sample of small chimney with animals. Location is at Waypoint #1 (venting site found by <i>Okeanos Explorer</i>). Small active chimney on a sulfide mound located on a broken up lava flow.	20.82146	144.70705	920	41	2016-12-04T00_30_18.839543_S5K.jpg
2016-12-04	00:32	Sample crumbled on top of the basket. Not sure if any made it into the biobox.	20.82147	144.70699	920	41	2016-12-04T00_32_37.845133_S5K.jpg
2016-12-04	00:33	There is a piece on the top of the sled which they are trying to grab and place into the biobox.	20.82147	144.70701	920	41	2016-12-04T00_33_10.852409_S5K.jpg
2016-12-04	00:33	Looks like that piece of sulfide did not have snails.	20.82147	144.70703	920	40	S5K01778.jpg
2016-12-04	00:34	Second piece of sulfide did have a snail.	20.82147	144.70703	920	40	S5K01799.jpg
2016-12-04	00:35	Going to try to do a quick HFS sample of this chimney.	20.82147	144.70704	920	39	2016-12-04T00_35_35.823816_S5K.jpg
2016-12-04	00:36	Dave is speculating the temperature would be about 100deg based on the clarity and minerals revealed after the sample.	20.82148	144.70705	920	39	S5K01936.jpg
2016-12-04	00:37	Background pH=8.03 O2=1.28 ml/l with the HFS wand.	20.82150	144.70708	920	39	S5K01974.jpg
2016-12-04	00:38	The hockey pucks broke off the HFS wand. Will fix after the dive and there is another handle.	20.82149	144.70707	920	39	S5K02022.jpg
2016-12-04	00:38	Attempting to grab the HFS wand by the t-handle.	20.82149	144.70708	920	39	
2016-12-04	00:39	Highlights were on from 00:26 to 00:38 while sampling chimney.	20.82149	144.70708	920	39	2016-12-04T00_39_18.848251_S5K.jpg
2016-12-04	00:40	HD stopped recording at some point, we don't know when. Turned back on manually at 00:29.	20.82149	144.70708	920	40	S5K02140.jpg
2016-12-04	00:40	Can't reach from here. Need to hop forward with the ROV.	20.82149	144.70708	920	40	2016-12-04T00_40_08.836671_S5K.jpg
2016-12-04	00:40	Retracting the tray to reach further.	20.82149	144.70708	920	40	S5K02166.jpg

Date	Time	S36 - Chamorro - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-04	00:41	HFS pump on.	20.82150	144.70708	920	40	2016-12-04T00_41_55.827680_S5K.jpg
2016-12-04	00:41	Seems the H264 conversion froze at some point during sampling too.	20.82150	144.70708	920	40	2016-12-04T00_41_55.827680_S5K.jpg
2016-12-04	00:43	Temperature is going up.	20.82150	144.70708	920	40	S5K02343.jpg
2016-12-04	00:43	Highlights on. Fluid sampling from base of sampled chimney.	20.82150	144.70708	920	40	S5K02365.jpg
2016-12-04	00:44	S36-HFS-02 Start 00:44. Filtered Piston #1. At the sulfide just sampled on the sulfide mound in the broken up lava flow.	20.82150	144.70708	920	40	S5K02434.jpg
2016-12-04	00:46	Temperature rose quickly up to over 150°C. Flush pump off and on during sample.	20.82150	144.70708	920	40	S5K02514.jpg
2016-12-04	00:46	There is no evidence of exhaust.	20.82150	144.70708	920	40	2016-12-04T00_46_52.841902_S5K.jpg
2016-12-04	00:47	Stop. 00:47 Tmax=154.7 Tavg=135. vol=550	20.82149	144.70708	920	40	
2016-12-04	00:47	S36-HFS-03 Unfiltered piston #2. Start 00:47. No exhaust. Exact same location.	20.82149	144.70707	920	40	2016-12-04T00_47_42.852709_S5K.jpg
2016-12-04	00:49	Stop 00:49. Tmax=148 Tavg=107 vol=490	20.82149	144.70706	920	40	2016-12-04T00_49_33.826147_S5K.jpg
2016-12-04	00:50	S36-HFS-04 Start Unfiltered Bag #16. Can see exhaust with the bag sample. Flush pump is on. Same location.	20.82148	144.70707	920	40	S5K02791.jpg
2016-12-04	00:52	Wand has pulled out of the hole and then put back in.	20.82148	144.70707	920	40	2016-12-04T00_52_05.832978_S5K.jpg
2016-12-04	00:52	Highlights off at 00:48	20.82148	144.70707	920	40	S5K02880.jpg
2016-12-04	00:53	Stop 00:53. Tmax=139 Tavg=120 vol=480	20.82149	144.70706	920	40	
2016-12-04	00:53	S36-HFS-05 Start 00:53. Unfiltered Bag #18 At same location. Can see exhaust.	20.82150	144.70705	920	40	2016-12-04T00_53_19.842745_S5K.jpg
2016-12-04	00:55	Stop 00:55. Tmax=155.3 Tavg=149.4 vol=460 T2=40.	20.82153	144.70705	920	41	S5K03068.jpg
2016-12-04	00:56	Attempting to grab an older sulfide sample located at the base of this active chimney.	20.82147	144.70715	920	41	S5K03144.jpg
2016-12-04	00:57	Cut-off so no sample of darker/older sulfide.	20.82148	144.70711	920	42	S5K03192.jpg
2016-12-04	00:57	Coming off bottom due to the winds building.	20.82148	144.70710	918	42	S5K03211.jpg
2016-12-04	00:58	Putting the HFS wand in the holster.	20.82153	144.70710	916	49	2016-12-04T00_58_19.826699_S5K.jpg
2016-12-04	00:58	Another chimney and mound.	20.82156	144.70712	916	60	2016-12-04T00_58_43.840802_S5K.jpg
2016-12-04	01:00	HD stopped by itself again.	20.82170	144.70715	911	69	S5K03360.jpg
2016-12-04	01:01	Highlights on 01:00 as HD stopped working, could still see a bit of bottom. Off at 01:01 as ascending.	20.82176	144.70723	899	78	S5K03413.jpg
2016-12-04	01:03	Wand is in the holster and working on the bungee. There are still snails on the porch.	20.82159	144.70686	844	217	S5K03553.jpg
2016-12-04	01:05	After bungee will try to suction up the snails to preserve the sample.	20.82166	144.70667	790	264	S5K03671.jpg
2016-12-04	01:09	Trying to suction the snail.	20.82165	144.70627	637	220	S5K03931.jpg
2016-12-04	01:10	Suction of the snail did not work. The snail may continue to cling to the basket on recovery. There are also bits of sulfide in front of the AFT biobox.	20.82166	144.70630	616	248	S5K03983.jpg

Table 6.6-4 Dive S37 – Illium

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
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Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	00:16	Bottom is in sight.	18.21279	144.70696	3644	346	
2016-12-05	00:17	Only seeing view in bottom camera.	18.21280	144.70696	3645	346	
2016-12-05	00:18	Ambient temperature is 1.4°C.	18.21280	144.70696	3645	346	
2016-12-05	00:18	Recording ROV gauges.	18.21280	144.70696	3645	346	2016-12-05T00_18_45.186169_S5K.jpg
2016-12-05	00:19	Depth here is about 10m shallower than target. Navigation is showing us downslope of the target landing site so there is a significant depth offset with the Sentry bathymetry.	18.21279	144.70696	3645	346	
2016-12-05	00:20	Bottom appears to be rubble.	18.21279	144.70696	3651	346	
2016-12-05	00:20	First view of bottom in science camera. Rubble of pillow lavas.	18.21279	144.70696	3652	347	S5K14253.jpg
2016-12-05	00:21	Shrimp floating in the water.	18.21279	144.70696	3652	346	S5K14306.jpg
2016-12-05	00:22	Pillow basalts.	18.21280	144.70696	3652	346	2016-12-05T00_22_25.159520_S5K.jpg
2016-12-05	00:24	Checking camera controls.	18.21280	144.70696	3652	346	
2016-12-05	00:26	Using INS for navigation still.	18.21280	144.70696	3651	346	
2016-12-05	00:26	Brittle star in foreground?	18.21279	144.70696	3652	347	S5K14599.jpg
2016-12-05	00:26	Plan is to move upslope to the reported vent depth than lateral along the contour depth to look for Illium.	18.21280	144.70696	3652	346	2016-12-05T00_26_53.144048_S5K.jpg
2016-12-05	00:30	Moving upslope to the target depth.	18.21280	144.70698	3649	359	
2016-12-05	00:30	ROV is 10m off the bottom so not a good view in the science camera.	18.21281	144.70698	3644	358	2016-12-05T00_30_17.155781_S5K.jpg
2016-12-05	00:30	Dandelion and sediment coating on the pillow rubble.	18.21286	144.70699	3648	2	2016-12-05T00_30_57.163177_S5K.jpg
2016-12-05	00:31	Turned on some lights.	18.21288	144.70701	3647	1	S5K14874.jpg
2016-12-05	00:31	Nice views of pillow tubes with quite a bit of sediment.	18.21288	144.70703	3646	9	2016-12-05T00_31_54.163967_S5K.jpg
2016-12-05	00:32	Sediment and oxide coating with some smaller pieces here.	18.21289	144.70708	3644	11	2016-12-05T00_32_37.175784_S5K.jpg
2016-12-05	00:33	Actually moved to the east instead of the intended north.	18.21287	144.70719	3645	22	2016-12-05T00_33_39.170376_S5K.jpg
2016-12-05	00:34	Broken pillow lavas coming upslope. Some larger tubes mixed with smaller, angular rubble.	18.21286	144.70719	3644	28	2016-12-05T00_34_52.166070_S5K.jpg
2016-12-05	00:35	Switched to USBL navigation and got a navigation jump to the west.	18.21286	144.70723	3643	29	2016-12-05T00_35_31.175652_S5K.jpg
2016-12-05	00:36	See some pillow skins and large tubes broken up.	18.21283	144.70734	3640	29	S5K15169.jpg
2016-12-05	00:36	Holding position while resolving some navigational issues.	18.21293	144.70703	3640	27	2016-12-05T00_36_41.183636_S5K.jpg
2016-12-05	00:37	We are about 10m due east of waypoint 1 and the depth offset is about 20m.	18.21289	144.70704	3639	28	2016-12-05T00_37_08.173767_S5K.jpg
2016-12-05	00:37	More like 20m east of the waypoint.	18.21287	144.70708	3639	28	2016-12-05T00_37_56.195048_S5K.jpg
2016-12-05	00:38	whip coral	18.21286	144.70710	3639	26	
2016-12-05	00:38	Non-vent biology on the lava.	18.21285	144.70710	3639	26	2016-12-05T00_38_25.182303_S5K.jpg
2016-12-05	00:39	Crinoid?	18.21288	144.70709	3639	27	2016-12-05T00_39_26.170990_S5K.jpg
2016-12-05	00:39	No, coral	18.21287	144.70709	3639	28	
2016-12-05	00:40	Thank you Verena!	18.21285	144.70709	3639	28	S5K15415.jpg
2016-12-05	00:41	Trying to hold position here while resolving some navigational issues.	18.21283	144.70690	3639	28	S5K15463.jpg
2016-12-05	00:41	Rattail in the distance.	18.21281	144.70687	3638	28	2016-12-05T00_41_44.168186_S5K.jpg
2016-12-05	00:42	<i>macourid</i> rattail	18.21280	144.70684	3639	27	
2016-12-05	00:42	Fish behind the coral.	18.21280	144.70683	3639	27	2016-12-05T00_42_11.165030_S5K.jpg

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	00:43	oops spelling: <i>macrouridae</i>	18.21302	144.70706	3638	28	
2016-12-05	00:43	Navigation jumped but the new position would be more consistent with the depth.	18.21306	144.70705	3638	26	S5K15619.jpg
2016-12-05	00:45	Oxidized piece of rock.	18.21319	144.70703	3637	29	2016-12-05T00_45_21.183445_S5K.jpg
2016-12-05	00:46	Slowly creeping up the slope at 043deg.	18.21328	144.70700	3637	40	
2016-12-05	00:46	Stalked glass sponge.	18.21263	144.70734	3637	41	
2016-12-05	00:47	Big jump in navigation is hopefully bogus. Puts us too far east.	18.21260	144.70736	3637	42	
2016-12-05	00:48	INS: Inertial navigation system.	18.21280	144.70709	3636	47	2016-12-05T00_48_39.146462_S5K.jpg
2016-12-05	00:49	Using INS to navigate.	18.21290	144.70703	3635	58	2016-12-05T00_49_29.164798_S5K.jpg
2016-12-05	00:49	Gorgonian corals: large white.	18.21289	144.70704	3635	54	
2016-12-05	00:50	USBL and INS are fairly close to the same position.	18.21288	144.70706	3637	56	S5K15996.jpg
2016-12-05	00:50	Anemone on gorgonians.	18.21285	144.70711	3635	56	
2016-12-05	00:51	Very large broken lava tubes. Appear to be an intact pile here with broken edges.	18.21283	144.70716	3633	55	S5K16062.jpg
2016-12-05	00:51	<i>Cladorhizid</i> sponge.	18.21283	144.70717	3633	53	
2016-12-05	00:52	Anemone.	18.21280	144.70725	3630	40	
2016-12-05	00:53	Some closeup framegrabs of the anemone.	18.21287	144.70713	3628	36	S5K16184.jpg
2016-12-05	00:53	Shrimp in the rocks.	18.21285	144.70707	3625	36	2016-12-05T00_53_46.150426_S5K.jpg
2016-12-05	00:54	Dandelion.	18.21289	144.70708	3624	35	S5K16250.jpg
2016-12-05	00:54	Large tubes with striations on the pillows.	18.21290	144.70708	3623	36	2016-12-05T00_54_28.158368_S5K.jpg
2016-12-05	00:54	Nice pillows and sponge.	18.21293	144.70710	3623	36	2016-12-05T00_54_48.172315_S5K.jpg
2016-12-05	00:54	Stalked sponges.	18.21294	144.70710	3622	36	S5K16293.jpg
2016-12-05	00:55	Galatheid crab.	18.21294	144.70712	3620	36	2016-12-05T00_55_24.149827_S5K.jpg
2016-12-05	00:55	Beautiful corals in the lava field.	18.21296	144.70713	3619	35	2016-12-05T00_55_40.167502_S5K.jpg
2016-12-05	00:55	Crabs are a sign that vent is somewhere around.	18.21297	144.70714	3619	36	
2016-12-05	00:56	Stalked crinoid.	18.21300	144.70715	3617	36	
2016-12-05	00:56	ROV navigation is not moving although we are clearly moving up the slope. Having some issues.	18.21300	144.70715	3617	36	2016-12-05T00_56_21.168368_S5K.jpg
2016-12-05	00:57	Yellow staining on the rocks and looks like an old sulfide chimney.	18.21303	144.70720	3616	36	S5K16424.jpg
2016-12-05	00:57	Old chimney.	18.21304	144.70721	3614	36	2016-12-05T00_57_22.167976_S5K.jpg
2016-12-05	00:57	Old chimney as we came up the lava-tube slope.	18.21304	144.70721	3614	36	S5K16450.jpg
2016-12-05	00:59	View of the top of the old sulfide.	18.21314	144.70729	3611	36	S5K16548.jpg
2016-12-05	00:59	Crab at base of the old chimney.	18.21317	144.70732	3612	35	S5K16574.jpg
2016-12-05	00:59	Old chimneys with fauna: <i>pennatulacean</i> corals and <i>cladorhizid</i> sponge.	18.21318	144.70732	3612	35	S5K16573.jpg
2016-12-05	01:00	Navigation jumped 45meters to the east and slightly south.	18.21321	144.70735	3611	35	
2016-12-05	01:00	Density of squat lobsters increasing.	18.21323	144.70736	3610	34	
2016-12-05	01:01	Took some framegrabs of the top of the chimney.	18.21330	144.70748	3610	35	2016-12-05T01_01_45.168307_S5K.jpg
2016-12-05	01:02	Preparing to take a sample of this old chimney.	18.21325	144.70746	3610	34	S5K16749.jpg
2016-12-05	01:03	Seeing quite a few crabs on the seafloor beyond the chimney.	18.21324	144.70747	3610	33	S5K16787.jpg

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	01:03	Those are squat lobsters on the seafloor.	18.21317	144.70740	3611	40	S5K16813.jpg
2016-12-05	01:05	If the chimney falls apart when touched it is probably iron oxide.	18.21316	144.70735	3610	43	
2016-12-05	01:06	Using the port arm to try to capture a sample.	18.21315	144.70731	3610	44	S5K16988.jpg
2016-12-05	01:07	Navigation jumps could have us very near waypoint #2 or further to the east.	18.21314	144.70729	3610	45	2016-12-05T01_07_09.204482_S5K.jpg
2016-12-05	01:07	Currently nav has the ROV to the east.	18.21318	144.70728	3610	45	2016-12-05T01_07_42.202485_S5K.jpg
2016-12-05	01:08	Currently downslope from the target depth of Illium vent.	18.21316	144.70728	3610	45	2016-12-05T01_08_40.249428_S5K.jpg
2016-12-05	01:09	Top is crumbling.	18.21316	144.70727	3610	43	2016-12-05T01_09_53.203344_S5K.jpg
2016-12-05	01:10	SAMPLE S37-Geo-01. Old chimney downslope of Illium vent target. Old chimney on an old lava tube flow as we came up the slope. Squat lobsters at the base. Going in port-aft section of the forward biobox. (Piece went in STBD part of box as well).	18.21318	144.70730	3610	42	2016-12-05T01_10_19.200984_S5K.jpg
2016-12-05	01:12	Going to continue upslope after sampling.	18.21322	144.70731	3608	28	S5K17373.jpg
2016-12-05	01:13	Navigation is drifting to the west now.	18.21330	144.70730	3609	28	2016-12-05T01_13_31.177420_S5K.jpg
2016-12-05	01:14	Back in pillow lavas with sediment as we head upslope.	18.21320	144.70735	3611	28	2016-12-05T01_14_07.194101_S5K.jpg
2016-12-05	01:14	HD new file started.	18.21321	144.70736	3610	27	2016-12-05T01_14_19.206253_S5K.jpg
2016-12-05	01:14	Some more older hydrothermal material and some squat lobsters.	18.21323	144.70737	3609	26	2016-12-05T01_14_36.189559_S5K.jpg
2016-12-05	01:15	Pile of sediment and broken lava tubes.	18.21326	144.70738	3608	28	S5K17500.jpg
2016-12-05	01:15	Doing white balance on the science camera.	18.21330	144.70737	3605	28	2016-12-05T01_15_39.170774_S5K.jpg
2016-12-05	01:16	Within 5m of the target depth.	18.21331	144.70742	3600	25	2016-12-05T01_16_49.190260_S5K.jpg
2016-12-05	01:16	Anemones and squat lobsters on pillow lavas.	18.21331	144.70742	3599	25	2016-12-05T01_16_52.192104_S5K.jpg
2016-12-05	01:17	Anemones also indicate vent in the vicinity.	18.21333	144.70743	3599	25	S5K17624.jpg
2016-12-05	01:17	Lots of old hydrothermal material mixed in with the lavas.	18.21336	144.70743	3597	25	S5K17663.jpg
2016-12-05	01:18	At the target depth so will move to the right at this depth.	18.21336	144.70744	3596	25	S5K17679.jpg
2016-12-05	01:19	Possible chimneys.	18.21332	144.70750	3593	100	2016-12-05T01_19_10.198261_S5K.jpg
2016-12-05	01:19	More sulfides.	18.21332	144.70753	3592	101	2016-12-05T01_19_26.213206_S5K.jpg
2016-12-05	01:19	Visibility is degrading.	18.21327	144.70757	3591	98	S5K17789.jpg
2016-12-05	01:20	Some flow here in the white staining.	18.21335	144.70754	3589	93	2016-12-05T01_20_22.204826_S5K.jpg
2016-12-05	01:20	Some flow seeping out here.	18.21335	144.70755	3590	95	2016-12-05T01_20_29.214687_S5K.jpg
2016-12-05	01:21	There is a lot more debris in the water.	18.21326	144.70760	3592	98	S5K17903.jpg
2016-12-05	01:22	Going to head the ROV into the slope but drive along the contour to the east.	18.21322	144.70760	3594	97	2016-12-05T01_22_39.205274_S5K.jpg
2016-12-05	01:25	Seeing less hydrothermal material here. Older pillows and corals.	18.21311	144.70772	3595	45	S5K18099.jpg
2016-12-05	01:25	Gorgonian corals fairly abundant so must be food; could be hydrothermal source?	18.21310	144.70774	3595	45	S5K18112.jpg
2016-12-05	01:25	Water is clearer here so want to go back to the area with the sulfides and murky water.	18.21309	144.70775	3595	47	
2016-12-05	01:26	Large anemones and squat lobsters.	18.21318	144.70768	3595	1	2016-12-05T01_26_44.226126_S5K.jpg
2016-12-05	01:27	Steep slope and some stained material here.	18.21321	144.70764	3595	1	2016-12-05T01_27_32.203806_S5K.jpg
2016-12-05	01:27	Significant staining and seeing some shimmer in the water.	18.21323	144.70762	3595	2	S5K18267.jpg

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	01:28	More debris in the water.	18.21323	144.70762	3595	1	2016-12-05T01_28_15.215207_S5K.jpg
2016-12-05	01:28	Shimmering water.	18.21324	144.70762	3595	1	2016-12-05T01_28_17.220315_S5K.jpg
2016-12-05	01:28	Going to continue to move west along this contour.	18.21324	144.70761	3595	1	2016-12-05T01_28_36.217912_S5K.jpg
2016-12-05	01:29	<i>Bythograeid</i> crab.	18.21326	144.70758	3595	3	S5K18350.jpg
2016-12-05	01:29	Literature said the vent was at this depth but also described being on top of the ridge. At this depth we are on a slope.	18.21326	144.70758	3595	2	2016-12-05T01_29_23.215126_S5K.jpg
2016-12-05	01:29	Just went past a streak of hydrothermal material and now over lavas again. There are still squat lobsters here.	18.21332	144.70753	3595	0	S5K18391.jpg
2016-12-05	01:30	<i>Munidopsis marianica</i> described from this site.	18.21333	144.70753	3595	359	2016-12-05T01_30_02.227161_S5K.jpg
2016-12-05	01:30	Some patches of hydrothermal sediments here. Snail and lobster.	18.21338	144.70749	3595	1	2016-12-05T01_30_33.224537_S5K.jpg
2016-12-05	01:31	<i>Phymorhynchid</i> snail but not described.	18.21342	144.70748	3595	0	S5K18447.jpg
2016-12-05	01:31	Lots of squat lobsters in the distance.	18.21343	144.70747	3595	360	S5K18477.jpg
2016-12-05	01:31	Seems like more squat lobsters here.	18.21344	144.70746	3595	1	2016-12-05T01_31_32.208581_S5K.jpg
2016-12-05	01:32	Sulfide streak coming from upslope.	18.21347	144.70745	3595	0	S5K18519.jpg
2016-12-05	01:32	Larger deposits of hydrothermal material.	18.21349	144.70742	3595	1	S5K18544.jpg
2016-12-05	01:32	Moving across the sulfide deposits. Probably the active chimneys are above us.	18.21350	144.70737	3595	359	2016-12-05T01_32_57.224910_S5K.jpg
2016-12-05	01:33	Fallen chimney.	18.21350	144.70737	3595	359	2016-12-05T01_32_55.223940_S5K.jpg
2016-12-05	01:33	Seeing pieces of sulfide in the lava tubes.	18.21355	144.70734	3595	7	2016-12-05T01_33_39.204814_S5K.jpg
2016-12-05	01:33	Squat lobsters more abundant near the sulfide deposits.	18.21357	144.70733	3595	9	S5K18632.jpg
2016-12-05	01:34	Back into large lava tubes. Going to move up and then back to the east.	18.21360	144.70730	3595	9	2016-12-05T01_34_30.222685_S5K.jpg
2016-12-05	01:35	Back into the sulfide debris. Seeing more anemones.	18.21359	144.70729	3593	21	S5K18696.jpg
2016-12-05	01:35	Now seeing anemones: <i>Marianactis bythios</i> is major indicator of periphery.	18.21358	144.70729	3591	35	S5K18710.jpg
2016-12-05	01:35	Up 5m and seeing larger hydrothermal pieces. Not at the top of the ridge. Inactive sulfide spires.	18.21358	144.70727	3591	68	2016-12-05T01_35_34.220143_S5K.jpg
2016-12-05	01:36	Moved back into lavas and smaller sulfide pieces.	18.21351	144.70738	3591	75	S5K18791.jpg
2016-12-05	01:37	Inactive sulfides.	18.21344	144.70745	3591	87	S5K18827.jpg
2016-12-05	01:37	Moving back toward where the shimmer was seen.	18.21341	144.70747	3591	87	
2016-12-05	01:38	Large stained pieces but no flow.	18.21337	144.70751	3591	85	2016-12-05T01_38_22.224671_S5K.jpg
2016-12-05	01:39	Reading gauges.	18.21332	144.70754	3591	84	
2016-12-05	01:41	Back into striated pillows and no sulfides.	18.21323	144.70765	3591	81	2016-12-05T01_40_59.211088_S5K.jpg
2016-12-05	01:41	Moving up the slope before lateralling over to the west again.	18.21319	144.70768	3590	66	
2016-12-05	01:42	Moved up to 3586m and going back to the west. Seeing lots of pillows.	18.21320	144.70774	3587	3	2016-12-05T01_42_49.213284_S5K.jpg
2016-12-05	01:43	Seeing some squat lobsters and anemones.	18.21331	144.70766	3587	349	S5K19228.jpg
2016-12-05	01:44	Water is murky.	18.21337	144.70765	3587	357	S5K19259.jpg
2016-12-05	01:45	Some staining.	18.21344	144.70767	3587	5	2016-12-05T01_45_07.220309_S5K.jpg
2016-12-05	01:46	Increase in biology.	18.21353	144.70764	3587	7	2016-12-05T01_46_28.202883_S5K.jpg
2016-12-05	01:47	Some bright staining in pilot cam.	18.21374	144.70758	3586	7	2016-12-05T01_47_34.198365_S5K.jpg

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	01:48	Seeing some shimmer and snails in the flow.	18.21362	144.70750	3583	2	2016-12-05T01_48_30.218465_S5K.jpg
2016-12-05	01:49	Lots of lobsters, anemones and snails here.	18.21362	144.70753	3583	2	2016-12-05T01_49_38.221672_S5K.jpg
2016-12-05	01:50	Highlights	18.21351	144.70753	3583	355	S5K19625.jpg
2016-12-05	01:51	Lots of snails in the cracks. Following this upslope.	18.21352	144.70747	3583	351	S5K19663.jpg
2016-12-05	01:51	Nice diffuse flow.	18.21354	144.70745	3583	343	2016-12-05T01_51_38.215894_S5K.jpg
2016-12-05	01:51	Hairy snail <i>Alvinichoncha hessleri</i> : loves really warm water.	18.21355	144.70743	3583	343	2016-12-05T01_51_43.221977_S5K.jpg
2016-12-05	01:52	Particulates increased; snails following cracks. See <i>galatheids</i> , <i>Marianactis</i> anemones and small gastropods.	18.21353	144.70741	3582	344	S5K19750.jpg
2016-12-05	01:53	Going to do some snail and fluid sampling here.	18.21354	144.70750	3580	329	2016-12-05T01_53_34.230605_S5K.jpg
2016-12-05	01:54	Only one type of large snail here.	18.21358	144.70743	3580	324	2016-12-05T01_54_09.230824_S5K.jpg
2016-12-05	01:57	Highlights off for 2 minutes but back on now.	18.21385	144.70730	3582	313	2016-12-05T01_57_24.227243_S5K.jpg
2016-12-05	01:59	ROV trying to get a good position.	18.21356	144.70731	3582	318	1480903198488S5K20193.jpg
2016-12-05	02:01	DEPLOY robo-snail. On top of ledge, atop snails and shrimp.	18.21372	144.70745	3583	323	2016-12-05T02_01_49.220836_S5K.jpg
2016-12-05	02:06	Highlights off at 02:06:25	18.21377	144.70737	3583	323	
2016-12-05	02:07	Preparing to sample with the Beast.	18.21396	144.70766	3583	323	2016-12-05T02_07_10.252067_S5K.jpg
2016-12-05	02:07	Snail Pile site: <i>Alviniconcha hessleri</i> . Shrimp is <i>Chorocaris vandoveri</i> . Crab is <i>Austinograea williamsi</i> . Squat lobster on edges is <i>Munidopsis marianica</i> .	18.21397	144.70768	3583	323	S5K20630.jpg
2016-12-05	02:08	Biology heaven with shrimp, snails, squat lobsters.	18.21407	144.70781	3583	323	2016-12-05T02_08_13.242395_S5K.jpg
2016-12-05	02:10	Crab on HFS hose.	18.21412	144.70769	3583	323	2016-12-05T02_10_04.225935_S5K.jpg
2016-12-05	02:10	Concentration of shrimp.	18.21394	144.70724	3583	323	2016-12-05T02_10_52.236520_S5K.jpg
2016-12-05	02:11	Scale worm on the rock to the left?	18.21398	144.70714	3583	323	2016-12-05T02_11_10.218856_S5K.jpg
2016-12-05	02:11	Not seeing any temperature increase with the sampler.	18.21398	144.70713	3583	323	2016-12-05T02_11_14.223029_S5K.jpg
2016-12-05	02:11	Wand is in good position so rebooting Beast and seeing temperature reading. At 19°C.	18.21405	144.70711	3583	323	S5K20888.jpg
2016-12-05	02:12	Scale worms too.	18.21408	144.70703	3583	323	2016-12-05T02_12_05.243093_S5K.jpg
2016-12-05	02:12	Turning on sensors. Temperature is holding at 22deg.	18.21407	144.70703	3583	323	S5K20938.jpg
2016-12-05	02:12	Wand tip is near the robosnail and pH is dropping.	18.21402	144.70699	3583	323	2016-12-05T02_12_41.250363_S5K.jpg
2016-12-05	02:13	Crab is trying to catch some shrimp. Scattering shrimp.	18.21405	144.70695	3583	323	2016-12-05T02_13_03.239084_S5K.jpg
2016-12-05	02:13	Highlights on.	18.21407	144.70688	3583	323	S5K21002.jpg
2016-12-05	02:13	pH is at 6. Background pH is 8.1.	18.21387	144.70717	3583	323	2016-12-05T02_13_46.245872_S5K.jpg
2016-12-05	02:14	O2 was .9 while doing a sensor reading and T1 is stable.	18.21357	144.70729	3583	323	2016-12-05T02_14_38.237983_S5K.jpg
2016-12-05	02:15	Wand tip is buried about halfway down in the snails.	18.21352	144.70745	3583	323	S5K21119.jpg
2016-12-05	02:16	S37-HFS-02 Unfiltered Piston #1. Titanium. In the clump of snails just .5m from the robosnail.	18.21350	144.70754	3583	323	
2016-12-05	02:17	Sample no good. Already filled.	18.21351	144.70763	3583	323	2016-12-05T02_17_24.231674_S5K.jpg
2016-12-05	02:18	Actually still sampling, the record was not cleared from the previous day. Still sampling.	18.21355	144.70751	3583	323	S5K21282.jpg
2016-12-05	02:18	S37-HFS-02 . Not seeing any flow so going to abort this sample.	18.21347	144.70740	3583	323	
2016-12-05	02:19	Stop sample.	18.21344	144.70743	3583	323	

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	02:19	S37-HFS-03 Start 02:19. Piston #2 Unfiltered titanium.	18.21345	144.70743	3583	323	2016-12-05T02_19_20.244787_S5K.jpg
2016-12-05	02:20	Lost communication with sampler.	18.21356	144.70755	3583	323	2016-12-05T02_20_40.265627_S5K.jpg
2016-12-05	02:21	Loose wire.	18.21363	144.70753	3583	323	S5K21468.jpg
2016-12-05	02:22	Not seeing any exhaust.	18.21367	144.70749	3583	323	S5K21524.jpg
2016-12-05	02:23	Rebooting the HFS software while sampling.	18.21376	144.70742	3583	323	S5K21604.jpg
2016-12-05	02:25	Turning power off to beast and recycling.	18.21347	144.70770	3583	323	2016-12-05T02_25_08.262930_S5K.jpg
2016-12-05	02:26	HD new file started.	18.21350	144.70778	3583	323	2016-12-05T02_26_15.255324_S5K.jpg
2016-12-05	02:28	Beast is back on.	18.21349	144.70791	3583	323	
2016-12-05	02:28	Stop. Tmax=27.4 Tavg=26.8 vol=193. S37-HFS-03.	18.21347	144.70776	3583	323	
2016-12-05	02:29	Going to try something besides a piston.	18.21342	144.70779	3583	323	S5K21967.jpg
2016-12-05	02:30	Closeup of hairy snail.	18.21339	144.70798	3583	323	2016-12-05T02_30_12.270409_S5K.jpg
2016-12-05	02:30	S37-HFS-04 Start 02:30 Unfiltered bag #16. Visible exhaust flow.	18.21338	144.70801	3583	323	2016-12-05T02_30_45.270230_S5K.jpg
2016-12-05	02:31	These samples have been at the same location. The wand has not moved from the clump of snails.	18.21337	144.70808	3583	323	S5K22103.jpg
2016-12-05	02:32	Mussel!	18.21337	144.70810	3583	323	2016-12-05T02_32_24.275942_S5K.jpg
2016-12-05	02:32	Same mussel species as Eifuku.	18.21337	144.70814	3583	323	2016-12-05T02_32_48.264839_S5K.jpg
2016-12-05	02:33	Stop 02:33. Tmax=28.7 Tavg=25.8 vol=402. T2=2.2	18.21356	144.70768	3583	323	2016-12-05T02_33_06.251149_S5K.jpg
2016-12-05	02:33	Also barnacles.	18.21336	144.70741	3583	323	2016-12-05T02_33_13.258799_S5K.jpg
2016-12-05	02:34	S37-HFS-05 Start 02:34. Unfiltered Bag #17.	18.21372	144.70705	3583	323	2016-12-05T02_34_48.254938_S5K.jpg
2016-12-05	02:35	This is FILTERED bag #17. No flow.	18.21369	144.70716	3583	323	2016-12-05T02_35_59.258520_S5K.jpg
2016-12-05	02:36	That is no flow in the exhaust.	18.21354	144.70734	3583	323	S5K22373.jpg
2016-12-05	02:37	Stop 02:37. Tmax=27.0 Tavg=23.6 vol=454 T2=8.	18.21369	144.70722	3583	323	S5K22452.jpg
2016-12-05	02:38	Flush pump on.	18.21373	144.70715	3583	323	2016-12-05T02_38_57.269170_S5K.jpg
2016-12-05	02:39	S37-HFS-06 Start 02:39. LVB #24. Seeing some bubbles and fresh water from exhaust. Same location.	18.21375	144.70714	3583	323	2016-12-05T02_39_14.254246_S5K.jpg
2016-12-05	02:40	Highlights off for now.	18.21398	144.70731	3583	323	S5K22612.jpg
2016-12-05	02:41	Highlights back on.	18.21408	144.70748	3583	323	2016-12-05T02_41_09.273361_S5K.jpg
2016-12-05	02:42	Snails occupying one side of the spire.	18.21392	144.70761	3583	323	2016-12-05T02_42_18.255935_S5K.jpg
2016-12-05	02:51	Navigational marker was set at the robosnail site using USBL navigation. Getting about 50m of jumps in navigation. These waypoints are saved in a file at the end of the dive.	18.21320	144.70751	3583	323	2016-12-05T02_51_39.256771_S5K.jpg
2016-12-05	02:52	50m radius of uncertainty in USBL navigation.	18.21330	144.70753	3583	323	S5K23372.jpg
2016-12-05	02:53	Highlights off for now.	18.21330	144.70753	3583	323	2016-12-05T02_52_59.271047_S5K.jpg
2016-12-05	02:55	There are 2 robosnail markers on the nav screen. One is "sighting" and the other is just "robo-snail". Quite a bit of offset between the two.	18.21349	144.70741	3582	323	2016-12-05T02_55_07.268126_S5K.jpg
2016-12-05	02:56	Actually not sure what the "sighting" one is. We are over 80m from the "robosnail" navigation marker on the screen.	18.21356	144.70721	3583	323	2016-12-05T02_56_17.269801_S5K.jpg
2016-12-05	03:00	Navigation is wandering all over while we are actually staying in a single location.	18.21395	144.70749	3583	323	2016-12-05T03_00_15.278045_S5K.jpg
2016-12-05	03:02	Wand moved during sample.	18.21243	144.70733	3582	322	S5K23919.jpg

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	03:05	Wand is moving.	18.21392	144.70821	3583	323	S5K24102.jpg
2016-12-05	03:06	Stop 03:06 Tmax=32.3 Tavg=30.4 vol=3297 T2=13	18.21356	144.70817	3583	323	S5K24171.jpg
2016-12-05	03:07	S37-HFS-07 Start. Unfiltered bag #18. Same location in robosnail patch.	18.21429	144.70730	3583	323	
2016-12-05	03:08	Exhaust is not working.	18.21389	144.70754	3582	323	
2016-12-05	03:10	Stop. 03:10 Tmax=27.6 Tavg=21.8 vol=500. T2=10 Sample probably not good.	18.21347	144.70766	3582	323	
2016-12-05	03:11	Checking HFS sensors.	18.21352	144.70754	3582	323	2016-12-05T03_11_06.299786_S5K.jpg
2016-12-05	03:11	May have an ROV hydraulic leak so dive might end early.	18.21353	144.70741	3582	323	2016-12-05T03_11_37.309748_S5K.jpg
2016-12-05	03:12	Sensors and pump are working.	18.21344	144.70723	3582	323	
2016-12-05	03:13	Reading of pH=6.19 O2=0.59 ml/l	18.21337	144.70714	3583	323	
2016-12-05	03:13	Temp is 18.5 for that reading.	18.21356	144.70730	3582	323	
2016-12-05	03:14	S37-HFS-08 Start 03:14. Filtered DNA #11.	18.21362	144.70741	3582	323	2016-12-05T03_14_28.303870_S5K.jpg
2016-12-05	03:15	Crab grabbing at HFS wand.	18.21362	144.70736	3582	323	2016-12-05T03_15_25.294936_S5K.jpg
2016-12-05	03:18	HD new file started.	18.21392	144.70764	3582	323	2016-12-05T03_18_41.292835_S5K.jpg
2016-12-05	03:19	Framegrab of darker crab.	18.21401	144.70768	3582	323	S5K24959.jpg
2016-12-05	03:22	Gauge reading.	18.21350	144.70770	3582	323	2016-12-05T03_22_48.295638_S5K.jpg
2016-12-05	03:24	Going to take ROV temperature probe readings around the robosnail while finishing HFS sampling.	18.21356	144.70800	3582	323	S5K25238.jpg
2016-12-05	03:25	Slight movement while trying to retrieve the probe.	18.21351	144.70813	3582	323	2016-12-05T03_25_30.301883_S5K.jpg
2016-12-05	03:27	Stop 03:27. Tmax=24.1 Tavg=20.6 vol=3000 T2=10.	18.21343	144.70836	3582	323	S5K25462.jpg
2016-12-05	03:29	S37-HFS-09 Unfiltered piston #8. Start 03:29. Same location.	18.21348	144.70766	3582	323	2016-12-05T03_29_04.318531_S5K.jpg
2016-12-05	03:31	Good flow on this sample.	18.21354	144.70754	3582	323	2016-12-05T03_31_21.315047_S5K.jpg
2016-12-05	03:33	Temperature reading near robosnail. T=12.3°C	18.21360	144.70733	3582	323	2016-12-05T03_33_22.313568_S5K.jpg
2016-12-05	03:36	Temperature reading at different location. 14.87°C.	18.21404	144.70725	3582	323	2016-12-05T03_36_22.321801_S5K.jpg
2016-12-05	03:36	Crab attacking temp probe.	18.21409	144.70723	3582	323	2016-12-05T03_36_50.320376_S5K.jpg
2016-12-05	03:37	Stop 03:37. Tmax=32.8 Tavg=28.2 vol=637 T2=13.	18.21407	144.70733	3582	323	
2016-12-05	03:38	Highlights on, temperature near robo-snail.	18.21384	144.70740	3582	323	2016-12-05T03_38_02.325006_S5K.jpg
2016-12-05	03:38	Temperature reading #3. High temp=21°C.	18.21383	144.70740	3582	323	2016-12-05T03_38_05.328076_S5K.jpg
2016-12-05	03:38	HFS sensors running.	18.21374	144.70747	3582	323	
2016-12-05	03:40	Temperature reading 3.52°C	18.21344	144.70753	3582	323	S5K26222.jpg
2016-12-05	03:41	pH=6.07 O2=0.57 ml/l Temp=29.0°C HFS sensors.	18.21340	144.70747	3582	323	
2016-12-05	03:42	Storing the ROV temperature wand.	18.21342	144.70754	3582	323	
2016-12-05	03:42	Going to place the HFS wand near the robosnail.	18.21349	144.70758	3582	323	2016-12-05T03_42_52.305146_S5K.jpg
2016-12-05	03:43	Two snails on the HFS wand. Want them as a sample.	18.21353	144.70759	3582	323	S5K26396.jpg
2016-12-05	03:43	One fell off so not going to try to keep the other one.	18.21354	144.70760	3582	323	S5K26431.jpg
2016-12-05	03:44	Now going to move the HFS wand near the robosnail.	18.21358	144.70758	3582	323	2016-12-05T03_44_53.298857_S5K.jpg
2016-12-05	03:45	Taking a reading near the robosnail.	18.21362	144.70756	3582	323	2016-12-05T03_45_50.328879_S5K.jpg
2016-12-05	03:46	At the robosnail region Temp=18.5°C pH=6.28 O2=1.59 ml/l.	18.21359	144.70753	3582	323	S5K26571.jpg
2016-12-05	03:47	Retrieving the robosnail and putting it in the forward biobox.	18.21364	144.70751	3582	323	

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	03:48	RECOVER Robosnail at the robosnail site.	18.21362	144.70752	3582	323	2016-12-05T03_48_33.319654_S5K.jpg
2016-12-05	03:49	Stowing the HFS wand.	18.21364	144.70745	3582	323	S5K26741.jpg
2016-12-05	03:49	Lots of crab wars going on in the background.	18.21363	144.70747	3582	323	2016-12-05T03_49_27.310286_S5K.jpg
2016-12-05	03:50	Sometimes the black color indicates disease as these are the same species of crabs.	18.21367	144.70761	3582	323	2016-12-05T03_50_21.332302_S5K.jpg
2016-12-05	03:50	Highlights off	18.21367	144.70761	3582	323	S5K26818.jpg
2016-12-05	03:51	Next we will try to sample some snails with a scoop.	18.21371	144.70761	3582	323	
2016-12-05	03:52	Retrieving the plastic scoop for snails.	18.21370	144.70759	3582	323	S5K26949.jpg
2016-12-05	03:54	S37-Bio-10 Scoop of biology in the same location as HFS samples.	18.21349	144.70763	3582	323	S5K27093.jpg
2016-12-05	03:55	Framegrabs of sample.	18.21374	144.70764	3582	323	S5K27139.jpg
2016-12-05	03:55	One big scoop of biology. Mainly snails, but other species are currently in the scoop.	18.21374	144.70764	3582	323	S5K27153.jpg
2016-12-05	03:56	Place scoop on the STBD-AFT quadrant of the forward biobox.	18.21378	144.70736	3582	323	2016-12-05T03_56_38.308850_S5K.jpg
2016-12-05	03:57	Last little bit of the scoop in the biobox.	18.21382	144.70719	3582	323	2016-12-05T03_57_47.308355_S5K.jpg
2016-12-05	03:58	S37-HFS-11 Background sample. Unfiltered Bag #20. At the robosnail site. Not seeing any flow.	18.21383	144.70714	3582	323	2016-12-05T03_58_05.329973_S5K.jpg
2016-12-05	03:59	HFS wand is in the holster.	18.21366	144.70755	3582	323	2016-12-05T03_59_34.312282_S5K.jpg
2016-12-05	04:00	Stop 04:00. Tmax=2.7 Tavg=2.6 vol=500 T2=2.25 Stopped on its own.	18.21345	144.70758	3582	323	
2016-12-05	04:01	Have the suction sampler in the claw.	18.21372	144.70751	3582	323	S5K27497.jpg
2016-12-05	04:02	S37-HFS-12 Start 04:02 Filtered bag #21. Background sample.	18.21375	144.70749	3582	323	S5K27521.jpg
2016-12-05	04:03	Tmax=2.6 Tavg=2.5 vol=500 T2=2.4	18.21366	144.70750	3582	323	
2016-12-05	04:03	Highlights on while suction sample.	18.21367	144.70751	3582	323	2016-12-05T04_03_56.321222_S5K.jpg
2016-12-05	04:03	S37-Bio-13 Suction of small biology bits into container #2. Mesh size=500.	18.21367	144.70751	3582	323	2016-12-05T04_03_57.321675_S5K.jpg
2016-12-05	04:05	Moving suction around the site to get the small bits.	18.21381	144.70731	3582	323	2016-12-05T04_05_05.324083_S5K.jpg
2016-12-05	04:05	Jostling in the snails and pushing them aside.	18.21375	144.70734	3582	323	2016-12-05T04_05_42.329557_S5K.jpg
2016-12-05	04:06	Got a few shrimp as well.	18.21370	144.70741	3582	323	S5K27754.jpg
2016-12-05	04:06	Lifting up clumps of snails while suctioning.	18.21370	144.70746	3582	323	2016-12-05T04_06_32.344749_S5K.jpg
2016-12-05	04:07	Taking readings.	18.21370	144.70752	3582	323	1480910838678S5K27833.jpg
2016-12-05	04:07	Done.	18.21368	144.70754	3582	323	
2016-12-05	04:07	Indexing sampler to jar #3.	18.21368	144.70756	3582	323	
2016-12-05	04:08	S37-Bio-14 Suction into jar #3. Trying to get some shrimp.	18.21367	144.70756	3582	323	2016-12-05T04_08_10.344472_S5K.jpg
2016-12-05	04:09	HFS readings in holster. pH=7.64 O2=2.67 Temp=2.8°C.	18.21366	144.70760	3582	323	
2016-12-05	04:09	Still suctioning.	18.21367	144.70759	3582	323	2016-12-05T04_09_52.344358_S5K.jpg
2016-12-05	04:10	Snail and shrimp ended up in jar #3.	18.21367	144.70757	3582	323	2016-12-05T04_10_19.337749_S5K.jpg
2016-12-05	04:10	Trying to not take the snails.	18.21367	144.70757	3582	323	S5K28031.jpg
2016-12-05	04:11	Indexing the jars with suction on.	18.21368	144.70755	3582	322	
2016-12-05	04:12	S37-HFS-15 Start 04:12. Filtered Piston #3. Background.	18.21368	144.70754	3582	323	2016-12-05T04_12_14.358400_S5K.jpg
2016-12-05	04:12	Highlights off.	18.21368	144.70754	3582	323	2016-12-05T04_12_19.324882_S5K.jpg
2016-12-05	04:13	Strapping down the Beast.	18.21366	144.70751	3582	323	2016-12-05T04_13_33.329262_S5K.jpg

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	04:14	Pulling in the porch.	18.21357	144.70745	3582	323	S5K28260.jpg
2016-12-05	04:14	Highlights on.	18.21364	144.70739	3582	323	
2016-12-05	04:15	Highlights on for Thom.	18.21360	144.70734	3582	323	2016-12-05T04_15_14.345895_S5K.jpg
2016-12-05	04:15	Crab fight.	18.21351	144.70751	3582	323	2016-12-05T04_15_43.331794_S5K.jpg
2016-12-05	04:17	Stop. 04:17 Tmax=2.9 Tavg=2.7 vol=700 T2=2.6	18.21357	144.70763	3582	323	
2016-12-05	04:17	Stop. 04:17 Tmax=2.9 Tavg=2.7 vol=700 T2=2.6	18.21357	144.70763	3582	323	
2016-12-05	04:19	Framegrabs of the site.	18.21363	144.70759	3582	323	S5K28544.jpg
2016-12-05	04:19	Highlights off.	18.21361	144.70752	3582	323	1480911588466S5K28583.jpg
2016-12-05	04:20	Preparing to put out a physical marker. Mkr-138.	18.21356	144.70749	3582	323	
2016-12-05	04:22	DEPLOY Mkr-138 at Robosnail site. Marker is just to the left of where the snail and water sampling occurred while facing 322deg.	18.21367	144.70771	3582	323	2016-12-05T04_22_24.347416_S5K.jpg
2016-12-05	04:24	Overview of Mkr-138 Site. Robosnail.	18.21388	144.70748	3582	317	2016-12-05T04_24_01.346700_S5K.jpg
2016-12-05	04:24	Scoop left on the seafloor.	18.21390	144.70734	3581	326	2016-12-05T04_24_45.330849_S5K.jpg
2016-12-05	04:25	Framegrab of the marker and scoop.	18.21386	144.70741	3582	348	2016-12-05T04_25_20.349739_S5K.jpg
2016-12-05	04:25	Picking up the scoop. Don't want to litter the seafloor.	18.21385	144.70743	3583	346	S5K28934.jpg
2016-12-05	04:26	HD new file started.	18.21387	144.70741	3583	344	2016-12-05T04_26_01.359089_S5K.jpg
2016-12-05	04:26	Going to pull away from the site and drive upslope to see the top of the ridge.	18.21388	144.70741	3579	343	2016-12-05T04_26_27.333646_S5K.jpg
2016-12-05	04:28	Gauge reading. Close to having to stop the dive due to hydraulic pressure.	18.21358	144.70758	3579	26	S5K29083.jpg
2016-12-05	04:29	Following the hydrothermal staining up the slope.	18.21356	144.70746	3578	322	2016-12-05T04_29_03.352571_S5K.jpg
2016-12-05	04:29	Following the staining and moving upslope.	18.21370	144.70731	3577	332	2016-12-05T04_29_38.353047_S5K.jpg
2016-12-05	04:30	Continuous hydrothermal deposits.	18.21377	144.70728	3573	350	S5K29201.jpg
2016-12-05	04:30	Getting to the top of a mound. Not active.	18.21394	144.70742	3570	359	S5K29240.jpg
2016-12-05	04:31	Appear to be on top of the ridge but mounds of inactive sulfides.	18.21415	144.70752	3563	353	2016-12-05T04_31_56.378605_S5K.jpg
2016-12-05	04:32	Water is very murky. Looks like dead sulfides.	18.21422	144.70735	3562	336	S5K29365.jpg
2016-12-05	04:33	Older chimneys	18.21427	144.70733	3561	350	2016-12-05T04_33_11.356547_S5K.jpg
2016-12-05	04:33	Lots of dead chimneys.	18.21432	144.70733	3559	354	2016-12-05T04_33_28.369758_S5K.jpg
2016-12-05	04:33	Alvin weight.	18.21438	144.70728	3559	358	S5K29431.jpg
2016-12-05	04:34	Found old <i>Alvin</i> weight. Putting a navigational marker here. Depth=3560.	18.21448	144.70729	3560	354	2016-12-05T04_34_36.378529_S5K.jpg
2016-12-05	04:35	Lots of dead chimneys.	18.21445	144.70726	3558	58	2016-12-05T04_35_17.382929_S5K.jpg
2016-12-05	04:35	Moving NW along the top of the ridge. Lots of sediment and murky water.	18.21448	144.70730	3559	354	2016-12-05T04_35_54.348584_S5K.jpg
2016-12-05	04:37	Going to turn to stbd and come back along the way we came (moving toward the ship).	18.21463	144.70728	3558	23	
2016-12-05	04:37	Looks dead but water is very murky.	18.21462	144.70742	3560	74	S5K29659.jpg
2016-12-05	04:38	Lots of chimneys but all dead.	18.21456	144.70758	3560	98	2016-12-05T04_38_24.373719_S5K.jpg
2016-12-05	04:39	Trying to turn right but the current is strong.	18.21449	144.70766	3560	121	
2016-12-05	04:42	All dead.	18.21406	144.70777	3564	166	2016-12-05T04_41_56.383110_S5K.jpg

Date	Time	S37 - Illium - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-05	04:43	More <i>Alvin</i> weights.	18.21374	144.70780	3573	156	2016-12-05T04_43_56.371819_S5K.jpg
2016-12-05	04:47	Fish.	18.21341	144.70809	3577	165	2016-12-05T04_47_43.365012_S5K.jpg
2016-12-05	04:48	Going down the nose of the ridge.	18.21332	144.70814	3581	123	
2016-12-05	04:49	Turning back around to go back up the ridge.	18.21333	144.70822	3585	24	2016-12-05T04_49_00.375493_S5K.jpg
2016-12-05	04:49	Sedimented pillow lavas.	18.21338	144.70823	3582	339	2016-12-05T04_49_17.398054_S5K.jpg
2016-12-05	04:49	Rubes and pillows. Gorgonians.	18.21333	144.70818	3580	287	2016-12-05T04_49_39.385163_S5K.jpg
2016-12-05	04:51	Need to come to the surface.	18.21324	144.70777	3592	301	2016-12-05T04_51_45.372185_S5K.jpg
2016-12-05	04:52	Coming up to the surface early due to a hydraulic leak.	18.21340	144.70767	3590	291	
2016-12-05	04:54	Off bottom. Turning off HD video.	18.21346	144.70727	3583	271	2016-12-05T04_54_14.380218_S5K.jpg

Table 6.6-5 Dive S39 – Alice Springs

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	02:38	Can see the bottom and a rubble hill.	18.20974	144.70715	3636	298	S5K11243.jpg
2016-12-06	02:38	Pillow lava and very steep.	18.20974	144.70715	3640	318	2016-12-06T02_38_37.107047_S5K.jpg
2016-12-06	02:39	A few squat lobsters and pillows do not look like a lot of sediment on them. Steep slope.	18.20972	144.70718	3641	320	1480991952475S5K11297.jpg
2016-12-06	02:39	Taking gauge reading.	18.20969	144.70722	3637	322	2016-12-06T02_39_42.121887_S5K.jpg
2016-12-06	02:40	White balance.	18.20970	144.70722	3638	325	2016-12-06T02_40_29.136123_S5K.jpg
2016-12-06	02:42	Rattail.	18.20988	144.70731	3639	327	2016-12-06T02_42_17.126156_S5K.jpg
2016-12-06	02:42	Anemone and fish.	18.20988	144.70731	3639	327	2016-12-06T02_42_16.130095_S5K.jpg
2016-12-06	02:42	Going to stay at the target depth and drive NE.	18.20989	144.70735	3639	340	2016-12-06T02_42_32.114554_S5K.jpg
2016-12-06	02:43	We are offset from the Sentry bathy map by about 20m. Following the Sentry contour depth with a 20m offset.	18.20989	144.70738	3639	10	2016-12-06T02_43_05.112119_S5K.jpg
2016-12-06	02:43	Opening the iris on the science camera.	18.20978	144.70735	3639	21	2016-12-06T02_43_48.131773_S5K.jpg
2016-12-06	02:44	Some intact pillows and broken up pieces of lava.	18.20984	144.70732	3639	17	2016-12-06T02_44_11.133644_S5K.jpg
2016-12-06	02:44	Sulfides!	18.20983	144.70736	3639	19	S5K11636.jpg
2016-12-06	02:45	Sulfides and anemones at the correct depth of the 1987 observations.	18.20985	144.70737	3639	19	2016-12-06T02_45_01.137883_S5K.jpg
2016-12-06	02:45	Coming up in depth following the sulfides.	18.20987	144.70741	3636	18	2016-12-06T02_45_47.130364_S5K.jpg
2016-12-06	02:46	A few chimneys.	18.20995	144.70744	3634	18	2016-12-06T02_46_05.150375_S5K.jpg
2016-12-06	02:46	Old chimneys	18.20998	144.70752	3632	19	2016-12-06T02_46_30.140999_S5K.jpg
2016-12-06	02:46	Looks like old chimneys with anemones and squat lobsters.	18.20998	144.70752	3632	19	1480992392565S5K11737.jpg
2016-12-06	02:47	Not seeing any flow or shimmer.	18.20997	144.70755	3630	3	2016-12-06T02_47_03.134932_S5K.jpg
2016-12-06	02:47	Coming back down a chimney.	18.20998	144.70757	3631	5	2016-12-06T02_47_19.155121_S5K.jpg
2016-12-06	02:47	Impressive old chimneys with solid diameter and manganese coating.	18.20998	144.70758	3633	355	2016-12-06T02_47_48.155138_S5K.jpg
2016-12-06	02:49	Chimney was several meters tall.	18.20994	144.70757	3635	343	S5K11888.jpg
2016-12-06	02:49	A lot of anemones.	18.20992	144.70755	3636	341	S5K11926.jpg
2016-12-06	02:49	Pile of fallen chimneys	18.20992	144.70755	3638	343	2016-12-06T02_49_50.143509_S5K.jpg
2016-12-06	02:50	Back down to 3640depth and will continue to follow this depth to the	18.20992	144.70758	3638	338	2016-12-06T02_50_05.154852_S5K.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
		east.					
2016-12-06	02:50	Continuing to follow this depth to the east.	18.20995	144.70762	3638	341	S5K11980.jpg
2016-12-06	02:50	Moving out of this sulfides area.	18.20998	144.70765	3638	342	2016-12-06T02_50_58.144677_S5K.jpg
2016-12-06	02:51	Back into pillow lavas and no hydrothermal material.	18.21002	144.70766	3638	342	2016-12-06T02_51_19.256284_S5K.jpg
2016-12-06	02:51	Smaller more angular pieces of lavas with a few anemones.	18.21008	144.70772	3638	341	S5K12052.jpg
2016-12-06	02:53	Coming around a ridge at this depth.	18.21013	144.70777	3638	359	S5K12125.jpg
2016-12-06	02:53	Some more intact lava tubes as we came around the ridge.	18.21016	144.70781	3638	338	S5K12149.jpg
2016-12-06	02:54	Staining on the rocks might not be hydrothermal.	18.21022	144.70779	3638	334	2016-12-06T02_53_59.158854_S5K.jpg
2016-12-06	02:54	More gorgonians and corals.	18.21028	144.70781	3638	335	2016-12-06T02_54_20.145174_S5K.jpg
2016-12-06	02:54	Large anemone and coral.	18.21031	144.70781	3638	335	S5K12222.jpg
2016-12-06	02:54	Gorgonian and large anemones.	18.21031	144.70782	3638	335	2016-12-06T02_54_43.171324_S5K.jpg
2016-12-06	02:55	Going to stop this traverse to the east along this contour.	18.21027	144.70787	3638	336	2016-12-06T02_55_16.169774_S5K.jpg
2016-12-06	02:55	Coming up to 3627m and then traverse to the west (or port).	18.21027	144.70787	3637	335	S5K12280.jpg
2016-12-06	02:56	A few lonely squat lobsters up at this depth. Anemones too.	18.21040	144.70779	3627	331	2016-12-06T02_56_37.147606_S5K.jpg
2016-12-06	02:57	At depth to head back southwest.	18.21041	144.70781	3628	278	S5K12365.jpg
2016-12-06	02:57	Coming around that ridge again.	18.21035	144.70783	3628	268	S5K12398.jpg
2016-12-06	02:57	Going around the corner of the ridge. Stained rocks again.	18.21031	144.70783	3628	267	S5K12422.jpg
2016-12-06	02:58	Continuing along this depth contour (3628m).	18.21028	144.70778	3628	266	S5K12454.jpg
2016-12-06	02:59	Back in broken up pieces of lava.	18.21018	144.70775	3628	266	S5K12503.jpg
2016-12-06	02:59	Fish and anemone with a few squat lobsters.	18.21014	144.70775	3628	266	2016-12-06T02_59_45.172615_S5K.jpg
2016-12-06	03:0	More squat lobsters and seeing hydrothermal rocks, murky water.	18.21014	144.70765	3628	266	2016-12-06T03_00_10.162093_S5K.jpg
2016-12-06	03:0	More anemones, especially a bit higher up.	18.21009	144.70764	3628	266	2016-12-06T03_00_35.154360_S5K.jpg
2016-12-06	03:0	Looks like more anemones further up the slope.	18.21008	144.70764	3628	266	2016-12-06T03_00_40.153452_S5K.jpg
2016-12-06	03:0	Coming around another ridge.	18.21007	144.70756	3628	266	2016-12-06T03_00_59.141920_S5K.jpg
2016-12-06	03:1	Ridge of anemones.	18.21006	144.70755	3628	266	2016-12-06T03_01_10.157985_S5K.jpg
2016-12-06	03:1	Almost back at the same place as we started but up higher.	18.21008	144.70736	3628	266	2016-12-06T03_01_30.141918_S5K.jpg
2016-12-06	03:1	Many more anemones.	18.21013	144.70736	3628	266	2016-12-06T03_01_57.172592_S5K.jpg
2016-12-06	03:2	Not seeing old sulfides or chimneys.	18.21010	144.70735	3628	265	S5K12690.jpg
2016-12-06	03:3	Water seems clearer and we have passed the area where we saw the sulfides deeper.	18.20999	144.70738	3627	265	S5K12747.jpg
2016-12-06	03:3	Coming up 5m and then will head back the other direction (east).	18.21000	144.70732	3627	266	2016-12-06T03_03_50.148767_S5K.jpg
2016-12-06	03:4	Definitely more anemones again as we are passing through the zone where the deeper sulfides were seen.	18.21008	144.70734	3623	328	
2016-12-06	03:5	Mussel!	18.21007	144.70737	3623	339	S5K12858.jpg
2016-12-06	03:5	Seeing shimmer and a few mussels in with the anemones.	18.21007	144.70736	3623	340	2016-12-06T03_05_37.155429_S5K.jpg
2016-12-06	03:5	Mussels, anemones and squat lobsters.	18.21007	144.70735	3623	338	S5K12889.jpg
2016-12-06	03:6	Might be barnacles.	18.21006	144.70737	3623	339	2016-12-06T03_06_02.154233_S5K.jpg
2016-12-06	03:8	Doing visual assessment.	18.20994	144.70742	3625	338	2016-12-06T03_08_25.163166_S5K.jpg
2016-12-06	03:8	Highlights on at anemone, shimmering water site.	18.20992	144.70743	3625	338	2016-12-06T03_08_42.171906_S5K.jpg
2016-12-06	03:9	Squat lobsters, anemones, mussels and barnacles.	18.20995	144.70747	3625	338	S5K13085.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	03:9	Navigation is jumping as we are stationary but we are at the same zone as the other traverses along this slope where the sulfides were seen deeper.	18.21001	144.70745	3625	353	2016-12-06T03_09_42.173085_S5K.jpg
2016-12-06	03:10	Highlights are on.	18.21003	144.70751	3626	357	
2016-12-06	03:11	Anemones with two color morphs.	18.21004	144.70743	3626	357	S5K13211.jpg
2016-12-06	03:11	Looks like dead barnacles.	18.21006	144.70741	3626	357	S5K13229.jpg
2016-12-06	03:11	No snails because it is too cold.	18.21006	144.70742	3626	357	2016-12-06T03_11_54.164146_S5K.jpg
2016-12-06	03:12	Anemone that is pulled in completely looked like a limpet.	18.21006	144.70741	3626	357	2016-12-06T03_12_35.174413_S5K.jpg
2016-12-06	03:12	Now wondering if barnacles are alive but not active.	18.21005	144.70741	3626	357	2016-12-06T03_12_59.168147_S5K.jpg
2016-12-06	03:13	<i>Neovaruca</i> (sp.?)	18.21004	144.70741	3626	357	2016-12-06T03_13_21.154947_S5K.jpg
2016-12-06	03:13	Barnacles growing on the mussels so it hasn't moved a lot.	18.21006	144.70740	3626	357	2016-12-06T03_13_46.177675_S5K.jpg
2016-12-06	03:13	Barnacles on the mussel shell, and one on top was damaged and is repairing.	18.21005	144.70740	3626	357	2016-12-06T03_13_53.147989_S5K.jpg
2016-12-06	03:14	Mussel had been damaged and is growing & repairing itself.	18.21006	144.70740	3626	357	2016-12-06T03_14_05.163697_S5K.jpg
2016-12-06	03:14	Repair is where that indentation was.	18.21005	144.70739	3626	357	S5K13419.jpg
2016-12-06	03:15	Crabs, squat lobsters, mussels, barnacles and anemones. Shimmer and diffuse flow.	18.21005	144.70741	3626	357	S5K13471.jpg
2016-12-06	03:15	Scale worm as well.	18.21005	144.70742	3626	357	S5K13504.jpg
2016-12-06	03:16	Scale worm on anemone.	18.21005	144.70742	3626	357	S5K13505.jpg
2016-12-06	03:16	Barnacles below the scale worm has cirri coming out.	18.21005	144.70742	3626	357	2016-12-06T03_16_30.178389_S5K.jpg
2016-12-06	03:17	Barnacles upper right have their cirri pointing down instead of up.	18.21108	144.70730	3626	355	2016-12-06T03_17_56.142958_S5K.jpg
2016-12-06	03:19	Going to get a temperature reading where the barnacles have their cirri extended.	18.21189	144.70717	3626	355	2016-12-06T03_19_01.156053_S5K.jpg
2016-12-06	03:20	Predicting that the temperature is only a few degrees above ambient. ROV probe is reading around 5.5-6deg, 7.03 was the high and ambient is about 1.8°C.	18.21151	144.70722	3626	353	2016-12-06T03_20_30.170717_S5K.jpg
2016-12-06	03:23	7.76°C the high here.	18.21052	144.70740	3626	353	2016-12-06T03_23_04.163360_S5K.jpg
2016-12-06	03:23	Saw a 7.91°C.	18.21053	144.70739	3626	353	2016-12-06T03_23_38.156731_S5K.jpg
2016-12-06	03:24	Crab fight and reading 8°C.	18.21046	144.70740	3626	353	2016-12-06T03_24_18.171041_S5K.jpg
2016-12-06	03:24	No mercy with these crabs.	18.21043	144.70739	3626	353	S5K14028.jpg
2016-12-06	03:25	Looking like they are trying to pull it apart.	18.21038	144.70740	3626	353	2016-12-06T03_25_25.165797_S5K.jpg
2016-12-06	03:26	Moving probe around and seeing up to 6°C.	18.21031	144.70740	3626	353	2016-12-06T03_26_56.152698_S5K.jpg
2016-12-06	03:27	7°C.	18.21030	144.70740	3626	353	S5K14188.jpg
2016-12-06	03:28	Highlights off.	18.21020	144.70746	3626	353	2016-12-06T03_28_51.168972_S5K.jpg
2016-12-06	03:29	Going to do a few quick HFS samples here of low-temperature diffuse flow.	18.21018	144.70744	3626	353	S5K14293.jpg
2016-12-06	03:31	Preparing the Beast for sampling.	18.21013	144.70740	3626	351	S5K14421.jpg
2016-12-06	03:31	Sensors were running up until now as well from the HFS.	18.21012	144.70740	3626	350	
2016-12-06	03:32	Started sensors again on the Beast.	18.21010	144.70738	3626	347	2016-12-06T03_32_09.158306_S5K.jpg
2016-12-06	03:33	Wand is out of the holster.	18.21012	144.70741	3626	347	2016-12-06T03_33_15.156370_S5K.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	03:33	Beast readings of pH=7.76 O2=3.16 ml/l on the edge of this area.	18.21012	144.70741	3626	347	S5K14552.jpg
2016-12-06	03:34	Trying to reach the same area as the crab fight and temperature wand.					
18.21013722	:	144.7074049	#####	347.51000	0	-2	
2016-12-06	03:35	Temperature is going up here. Over 5.7°C.	18.21016	144.70742	3626	348	S5K14696.jpg
2016-12-06	03:37	Warming up the sampler.	18.21015	144.70740	3626	348	
2016-12-06	03:38	Readings are pH=6.73 O2=2.84 Temp=7.1°C.	18.21010	144.70742	3626	347	2016-12-06T03_38_13.157141_S5K.jpg
2016-12-06	03:40	S39-HFS-01 Start 03:40. Unfiltered Piston #2. Have good flow.	18.21008	144.70744	3626	348	1480995610562S5K14955.jpg
2016-12-06	03:41	Species list here.					
18.21008177	:	144.7074319	#####	347.41000	-1	-3	
2016-12-06	03:41	Sampling at the same location as the biology video survey and ROV temperature measurements. Not the exact location of the crab fight where measured ROV temp.	18.21010	144.70747	3626	348	S5K15056.jpg
2016-12-06	03:43	Limpets as well and looks like they have moved with those circular areas on the rocks.	18.21010	144.70744	3626	347	2016-12-06T03_43_12.162380_S5K.jpg
2016-12-06	03:44	Stop. Tmax=7.8 Tavg=7.4 vol=597 T2=4	18.21008	144.70746	3626	347	S5K15209.jpg
2016-12-06	03:44	Another sensor reading.	18.21005	144.70742	3626	348	
2016-12-06	03:46	Anemone framegrabs.	18.21006	144.70725	3626	345	2016-12-06T03_46_53.172207_S5K.jpg
2016-12-06	03:47	Sensors: pH=6.67 O2=2.76 Temp=7.9 T2=4	18.21010	144.70731	3626	345	2016-12-06T03_47_17.168127_S5K.jpg
2016-12-06	03:47	Finished with the HFS sampler at this location.	18.21013	144.70734	3626	345	2016-12-06T03_47_57.154935_S5K.jpg
2016-12-06	03:48	Highlights on shortly with red shrimp floating by, but probably not a great video. 03:47 to 03:48.	18.21013	144.70735	3626	345	2016-12-06T03_48_20.159971_S5K.jpg
2016-12-06	03:49	Putting the wand back in the holster.	18.21013	144.70736	3626	344	S5K15487.jpg
2016-12-06	03:50	Plan is to map out the vertical extent of the venting zone.	18.21011	144.70738	3626	345	2016-12-06T03_50_29.469055_S5K.jpg
2016-12-06	03:50	First we will go upslope to see the extent.	18.21010	144.70739	3626	343	
2016-12-06	03:51	Pulling off this site and heading up slope.	18.21010	144.70741	3624	2	2016-12-06T03_51_58.177741_S5K.jpg
2016-12-06	03:52	HD new file started.	18.21011	144.70742	3623	360	S5K15668.jpg
2016-12-06	03:52	Moved out of the large barnacle patch but lots of anemones.	18.21012	144.70741	3622	1	S5K15686.jpg
2016-12-06	03:52	Some patches of venting with animals.	18.21016	144.70739	3619	1	S5K15707.jpg
2016-12-06	03:53	Pile of mussels.	18.21020	144.70736	3619	360	2016-12-06T03_53_06.152187_S5K.jpg
2016-12-06	03:53	Another little seep.	18.21020	144.70736	3619	357	S5K15734.jpg
2016-12-06	03:53	Mussels were at 3618m as moving upslope.	18.21024	144.70737	3618	334	
2016-12-06	03:54	Following the anemones up the hill.	18.21026	144.70737	3616	324	2016-12-06T03_54_09.178284_S5K.jpg
2016-12-06	03:54	Another venting area with barnacles and anemones.	18.21025	144.70735	3614	313	S5K15818.jpg
2016-12-06	03:54	Shimmering and lots of animals in a patch.	18.21026	144.70735	3613	309	S5K15827.jpg
2016-12-06	03:55	Zooming in on the patch of biology.	18.21025	144.70736	3612	309	2016-12-06T03_55_02.165712_S5K.jpg
2016-12-06	03:55	Highlights on at another venting area with snails this time. Immediately upslope of the last place.	18.21028	144.70740	3613	309	2016-12-06T03_55_27.161860_S5K.jpg
2016-12-06	03:55	Snails here so must be a bit warmer.	18.21029	144.70740	3613	309	2016-12-06T03_55_42.174913_S5K.jpg
2016-12-06	03:56	Also a shrimp.	18.21033	144.70737	3613	315	S5K15945.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	03:56	Putting nav marker here called Snails.	18.21034	144.70738	3613	316	S5K15948.jpg
2016-12-06	03:57	Depth is 3612.6 where this patch of snails are.	18.21033	144.70740	3613	315	2016-12-06T03_57_01.193357_S5K.jpg
2016-12-06	03:57	S39-snails-001 is nav marker!	18.21037	144.70734	3613	314	S5K15995.jpg
2016-12-06	03:57	There was a patch of concentrated flow.	18.21033	144.70738	3610	316	S5K16007.jpg
2016-12-06	03:58	Anemone stars	18.21030	144.70741	3610	316	2016-12-06T03_58_00.170636_S5K.jpg
2016-12-06	03:58	There is a focused flow.	18.21027	144.70742	3611	317	S5K16036.jpg
2016-12-06	03:59	Moving in for a sample of the flow.	18.21025	144.70735	3611	315	S5K16089.jpg
2016-12-06	03:59	Still positioning for sampling.	18.21014	144.70732	3609	312	2016-12-06T03_59_33.159866_S5K.jpg
2016-12-06	03:59	Highlights off while we reposition.	18.21001	144.70728	3608	311	S5K16129.jpg
2016-12-06	04:2	There are shrimp here in addition to the snails.	18.21040	144.70739	3611	301	S5K16297.jpg
2016-12-06	04:3	May be tubes made by sulfide worms as well. Will look more after temperature sampling.	18.21035	144.70736	3611	301	2016-12-06T04_03_37.183064_S5K.jpg
2016-12-06	04:4	Not seeing tubes after all.	18.21025	144.70738	3611	301	2016-12-06T04_04_39.185663_S5K.jpg
2016-12-06	04:4	Ready for sampling the temperature with the ROV probe.	18.21028	144.70740	3611	301	S5K16437.jpg
2016-12-06	04:5	Highlights on at more focused flow area. 04:02- 04:05	18.21031	144.70745	3611	301	2016-12-06T04_05_22.178236_S5K.jpg
2016-12-06	04:5	Guessing temperature could be as high as 200°C...taking bets.	18.21025	144.70754	3611	301	S5K16496.jpg
2016-12-06	04:7	Here comes the probe.	18.21021	144.70754	3611	301	2016-12-06T04_07_07.185910_S5K.jpg
2016-12-06	04:7	Animals not directly in the hot water.	18.21020	144.70752	3611	301	S5K16592.jpg
2016-12-06	04:7	Temperature is rising over 145deg...	18.21022	144.70748	3611	301	S5K16609.jpg
2016-12-06	04:8	High was just over 158°C. Going to move it slightly.	18.21032	144.70745	3611	301	2016-12-06T04_08_34.187955_S5K.jpg
2016-12-06	04:9	Cold around the edges, just at 25°C.	18.21032	144.70744	3611	301	S5K16696.jpg
2016-12-06	04:9	Very high gradient between the fluid and the ambient water.	18.21031	144.70741	3611	301	S5K16712.jpg
2016-12-06	04:9	Went in a hole.	18.21031	144.70736	3611	301	S5K16732.jpg
2016-12-06	04:10	Temperature was just about the same with a high of 157.6°C.	18.21027	144.70736	3611	301	2016-12-06T04_10_40.177875_S5K.jpg
2016-12-06	04:11	Done with ROV probe.	18.21025	144.70735	3611	306	S5K16815.jpg
2016-12-06	04:11	Will want to deploy the robosnail.	18.21024	144.70730	3611	305	2016-12-06T04_11_58.171618_S5K.jpg
2016-12-06	04:12	Going to stow the ROV probe temporarily in a biobox while doing other sampling and robosnail deployment.	18.21025	144.70731	3611	305	
2016-12-06	04:14	Now retrieving the robosnail.	18.21023	144.70736	3611	306	S5K16999.jpg
2016-12-06	04:16	Robosnail deployment.	18.21029	144.70739	3611	306	2016-12-06T04_16_06.165618_S5K.jpg
2016-12-06	04:16	DEPLOY Robosnail at this site in the vertical sulfide swath on the slope at 3611m where snails first seen.	18.21025	144.70745	3611	306	S5K17134.jpg
2016-12-06	04:17	Preparing to take HFS sample at this site.	18.21022	144.70748	3611	306	S5K17191.jpg
2016-12-06	04:17	Robosnail is behind the flow and hard to see in the shimmer.	18.21021	144.70740	3611	306	2016-12-06T04_17_47.170782_S5K.jpg
2016-12-06	04:19	Closing the biobox lid and moving the HFS wand into the focused flow.	18.21002	144.70756	3611	306	S5K17298.jpg
2016-12-06	04:20	Temperature rising.	18.21021	144.70748	3611	306	2016-12-06T04_20_31.203608_S5K.jpg
2016-12-06	04:22	Wand tip moved and temperature is going down.	18.21028	144.70733	3611	307	2016-12-06T04_22_38.191893_S5K.jpg
2016-12-06	04:22	Got some sensor readings while positioning the wand.	18.21032	144.70735	3611	307	S5K17519.jpg
2016-12-06	04:23	Put wand back in the flow and temperature is rising.	18.21034	144.70734	3611	307	2016-12-06T04_23_10.196131_S5K.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	04:24	Flow is now surrounding the vehicle and hard to see the focused flow.	18.21036	144.70726	3611	307	2016-12-06T04_24_05.175294_S5K.jpg
2016-12-06	04:24	S39-HFS-02 Start 04:24. Filtered Piston #1. At the focused flow at the nav marker snail-001 site where the ROV had a high temperature of 158deg.	18.21037	144.70719	3611	307	S5K17643.jpg
2016-12-06	04:27	Hard to get a good image on the science camera.	18.21029	144.70732	3611	307	S5K17793.jpg
2016-12-06	04:28	Stop 04:28 Tmax=126.5 Tavg=124.2 T2=26 vol=550.	18.21031	144.70736	3611	307	
2016-12-06	04:30	S39-HFS-03 Start 04:30. Unfiltered Piston #8. Using barbed to six-port. Seeing exhaust.	18.21032	144.70729	3611	307	S5K17974.jpg
2016-12-06	04:32	Temperature has risen to over 160°C while this wall of shimmer has engulfed the sampler.	18.21039	144.70732	3611	307	2016-12-06T04_32_01.188738_S5K.jpg
2016-12-06	04:35	Stop. Tmax=161.4 Tavg=158.5 vol=700 T2=32.	18.21025	144.70732	3611	307	
2016-12-06	04:36	Tip of wand may be gone.	18.21016	144.70737	3611	307	S5K18342.jpg
2016-12-06	04:37	S39-HFS-04 Start 04:37. Filtered Piston #7. At same location snail-001 near the robosnail deployment.	18.21015	144.70742	3611	307	
2016-12-06	04:38	Stop 04:38. Tmax=161.4 Tavg=161.2 vol=250 T2=30 Don't think it worked.	18.21023	144.70753	3611	307	
2016-12-06	04:39	S39-HFS-05 Start 04:39. Filtered Piston #3. Looks like it is working.	18.21024	144.70754	3611	307	2016-12-06T04_39_59.192988_S5K.jpg
2016-12-06	04:41	Same location in the focused flow.	18.21007	144.70783	3611	308	2016-12-06T04_41_26.187897_S5K.jpg
2016-12-06	04:42	Tip is either buried or got sheared off when the ROV moved.	18.21011	144.70748	3611	308	2016-12-06T04_42_36.193841_S5K.jpg
2016-12-06	04:44	Stop. Tmax=164.8 Tavg=163.1 T2=32 vol=606	18.21024	144.70722	3611	308	
2016-12-06	04:45	Taking HFS sensor reading.	18.21030	144.70730	3611	308	
2016-12-06	04:49	Done with the sampling in the focused flow with the Beast.	18.21027	144.70734	3611	309	2016-12-06T04_49_12.192778_S5K.jpg
2016-12-06	04:49	Tip is still there.	18.21026	144.70734	3611	309	2016-12-06T04_49_30.210536_S5K.jpg
2016-12-06	04:49	Holding wand up in the colder water to flush some cooler fluid through the sampler.	18.21024	144.70729	3611	309	S5K19136.jpg
2016-12-06	04:50	Robosnail looks happy. pH went down 4.5 and O2 to .15 (really low).	18.21025	144.70727	3611	309	2016-12-06T04_50_15.213823_S5K.jpg
2016-12-06	04:51	Going to take a LVB here so want to reposition the robosnail.	18.21030	144.70733	3611	309	
2016-12-06	04:52	Putting away the wand to the Beast before repositioning the robosnail and taking temperatures around it.	18.21025	144.70736	3611	310	2016-12-06T04_52_56.207267_S5K.jpg
2016-12-06	04:55	Wand is in the holster.	18.21021	144.70738	3611	310	
2016-12-06	04:55	Next we will take a gastight in the flow.	18.21026	144.70739	3611	310	2016-12-06T04_55_24.196920_S5K.jpg
2016-12-06	04:55	This is <i>SuBastian's</i> first gastight ever!	18.21026	144.70737	3611	310	2016-12-06T04_55_44.215548_S5K.jpg
2016-12-06	05:1	That is gastight Yellow #9.	18.21020	144.70738	3611	311	S5K19811.jpg
2016-12-06	05:1	Need a better grip.	18.21021	144.70738	3611	311	2016-12-06T05_01_30.235860_S5K.jpg
2016-12-06	05:1	HD new file started.	18.21018	144.70744	3611	312	S5K19853.jpg
2016-12-06	05:8	Highlights on for gastight sampling.	18.21018	144.70750	3611	311	2016-12-06T05_08_48.241259_S5K.jpg
2016-12-06	05:10	Will record view of the pilot cam.	18.21023	144.70751	3611	311	S5K20347.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	05:11	View from the pilot cam showing the tip in the flow. Tip is out of the flow when aligning ram.	18.21034	144.70740	3611	311	2016-12-06T05_11_06.213018_S5K.jpg
2016-12-06	05:12	Ram is aligned and using pilot cam to put wand tip in the flow.	18.21042	144.70729	3611	312	S5K20468.jpg
2016-12-06	05:14	S39-GTB-06 Fired. Yellow #9 GTB. In the hole with good verification of the wand tip in the pilot camera. Sample looked really good.	18.21041	144.70728	3611	312	2016-12-06T05_14_07.230523_S5K.jpg
2016-12-06	05:16	Stowing the GTB is also a 2-armed operation.	18.21017	144.70748	3611	312	
2016-12-06	05:19	Stowing the gastight back in the basket.	18.21008	144.70738	3611	312	S5K20930.jpg
2016-12-06	05:20	Highlights off.	18.21017	144.70736	3611	312	2016-12-06T05_20_07.215373_S5K.jpg
2016-12-06	05:20	Going to bungee the bottle down.	18.21020	144.70731	3611	312	2016-12-06T05_20_36.241903_S5K.jpg
2016-12-06	05:28	Gastight is bungeed down tight.	18.21016	144.70726	3611	313	2016-12-06T05_28_26.242686_S5K.jpg
2016-12-06	05:29	Taking gauge reading.	18.21021	144.70727	3611	312	2016-12-06T05_29_11.228748_S5K.jpg
2016-12-06	05:29	Next will shift the ROV over to port to better reach the snail patch to move the robosnail and take water samples of diffuse flow.	18.21019	144.70726	3611	312	
2016-12-06	05:30	Actually moving over to STBD.	18.21031	144.70715	3611	312	2016-12-06T05_30_39.253991_S5K.jpg
2016-12-06	05:31	Repositioning.	18.21034	144.70720	3611	312	2016-12-06T05_31_39.243847_S5K.jpg
2016-12-06	05:32	ROV shifted to the right (counter-clockwise).	18.21038	144.70719	3609	282	
2016-12-06	05:36	Trying to find the best place to position the ROV to sample the snail site.	18.21012	144.70724	3610	247	S5K21906.jpg
2016-12-06	05:37	This angle is difficult to maintain on the steep slope and with a loose substrate.	18.21011	144.70713	3611	250	2016-12-06T05_37_13.250316_S5K.jpg
2016-12-06	05:38	Retrieving the ROV temperature probe.	18.21019	144.70737	3611	250	1481002686647S5K22031.jpg
2016-12-06	05:40	Looks like <i>acmaeid</i> limpets. around snails.	18.21033	144.70744	3611	250	2016-12-06T05_40_15.238126_S5K.jpg
2016-12-06	05:40	Temperature here is 8.5 down to 6.5.	18.21034	144.70746	3611	250	S5K22169.jpg
2016-12-06	05:41	Temp behind is 6.4...6.7 here. Both about the same.	18.21033	144.70760	3611	250	2016-12-06T05_41_28.251366_S5K.jpg
2016-12-06	05:42	Different location 17...15...28....	18.21028	144.70722	3611	247	2016-12-06T05_42_56.267192_S5K.jpg
2016-12-06	05:43	Scaleworms and snails covered with iron but the limpets are not.	18.21031	144.70723	3611	247	
2016-12-06	05:43	Up to 112.	18.21031	144.70727	3611	247	S5K22354.jpg
2016-12-06	05:44	On top of this pile of the snails. High was 12...now in the 9's.	18.21043	144.70715	3611	245	2016-12-06T05_44_56.255483_S5K.jpg
2016-12-06	05:47	In the hole with the snails....12...15.23....15.67.	18.21030	144.70734	3611	245	2016-12-06T05_47_16.264476_S5K.jpg
2016-12-06	05:50	In the crack....over 84deg.	18.21022	144.70741	3611	245	S5K22768.jpg
2016-12-06	05:51	23deg here.	18.21031	144.70734	3611	245	2016-12-06T05_51_14.269583_S5K.jpg
2016-12-06	05:52	25deg here.	18.21034	144.70744	3611	244	
2016-12-06	05:52	16...17...18 on top of the snail.	18.21033	144.70749	3611	244	S5K22879.jpg
2016-12-06	05:53	Leaving the snail in place.	18.21029	144.70738	3611	244	S5K22934.jpg
2016-12-06	05:54	Stowing the ROV probe. Then setup for HFS diffuse sampling.	18.21018	144.70741	3611	244	2016-12-06T05_54_25.248911_S5K.jpg
2016-12-06	05:56	Actually going to hold the wand in the port arm.	18.21028	144.70760	3611	244	
2016-12-06	05:58	Going to pick up the HFS wand to sample the diffuse flow.	18.21033	144.70739	3611	244	2016-12-06T05_58_01.264394_S5K.jpg
2016-12-06	05:58	HFS sensors have been left on.	18.21034	144.70735	3611	244	
2016-12-06	05:59	Need to move the ROV a bit to reach with this arm.	18.21035	144.70734	3611	244	S5K23290.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	06:0	Moving slightly clockwise.	18.21022	144.70723	3610	242	2016-12-06T06_00_26.284236_S5K.jpg
2016-12-06	06:0	Putting the tray out and coming down. Sensors off on Beast.	18.21024	144.70726	3611	238	S5K23389.jpg
2016-12-06	06:1	Aiming for the crack with the 2 snails.	18.21038	144.70740	3611	238	2016-12-06T06_01_41.266331_S5K.jpg
2016-12-06	06:3	Tip is down in the crack and the temperature was cooler.	18.21021	144.70728	3611	237	2016-12-06T06_03_04.284552_S5K.jpg
2016-12-06	06:3	Wand is stable.	18.21021	144.70738	3611	237	S5K23564.jpg
2016-12-06	06:3	Probably too hot. Up to over 92.5.	18.21022	144.70739	3611	237	2016-12-06T06_03_50.262587_S5K.jpg
2016-12-06	06:4	Temperature was 48 but dropping...below 20deg.	18.21020	144.70745	3611	237	2016-12-06T06_04_30.271135_S5K.jpg
2016-12-06	06:5	Position here is too hot.	18.21024	144.70735	3611	237	2016-12-06T06_05_30.265824_S5K.jpg
2016-12-06	06:5	Position here may be good...44...dropping....below 20.	18.21027	144.70746	3611	237	2016-12-06T06_05_58.293737_S5K.jpg
2016-12-06	06:7	Temp dropped to 10deg.	18.21017	144.70764	3611	237	S5K23797.jpg
2016-12-06	06:8	Temperature ranges 61-59.6. Flush pump on.	18.21019	144.70772	3611	237	2016-12-06T06_08_07.288672_S5K.jpg
2016-12-06	06:11	S39-HFS-07 Start 06:11. LVB #24 Temperature started at about 44-45deg.	18.21029	144.70733	3611	237	2016-12-06T06_11_19.280853_S5K.jpg
2016-12-06	06:13	Crab has ripped off some food, probably a mussel and eating it.	18.21034	144.70733	3611	236	2016-12-06T06_13_11.298989_S5K.jpg
2016-12-06	06:13	Wand tip was moved.	18.21034	144.70733	3611	236	
2016-12-06	06:13	Checking the temperature and stopping the pump.	18.21035	144.70730	3611	236	S5K24177.jpg
2016-12-06	06:14	Moving tip up in the flow a bit more.	18.21032	144.70730	3611	236	2016-12-06T06_14_18.292191_S5K.jpg
2016-12-06	06:14	Starting the pump again.	18.21031	144.70727	3611	236	2016-12-06T06_14_40.281600_S5K.jpg
2016-12-06	06:15	Temp went down to 20 so moved just a tad more to the right.	18.21036	144.70726	3611	236	2016-12-06T06_15_22.289848_S5K.jpg
2016-12-06	06:15	Tip looks good here. Temp in the high 30's.	18.21036	144.70723	3611	236	S5K24288.jpg
2016-12-06	06:17	Need to move 1cm left.	18.21037	144.70733	3611	236	
2016-12-06	06:18	Moving slightly to the left.	18.21030	144.70727	3611	236	
2016-12-06	06:18	Vehicle moved.	18.21030	144.70726	3611	236	2016-12-06T06_18_43.294645_S5K.jpg
2016-12-06	06:19	Stopping here again.	18.21029	144.70734	3611	236	2016-12-06T06_19_19.294720_S5K.jpg
2016-12-06	06:19	Too cold.	18.21031	144.70736	3611	236	S5K24535.jpg
2016-12-06	06:20	Trying here.	18.21036	144.70753	3611	236	S5K24596.jpg
2016-12-06	06:21	Looks great here.	18.21029	144.70743	3611	236	2016-12-06T06_21_45.304867_S5K.jpg
2016-12-06	06:23	Tip came out.	18.21024	144.70746	3611	234	2016-12-06T06_23_18.297435_S5K.jpg
2016-12-06	06:23	Pausing sample.	18.21034	144.70737	3611	234	2016-12-06T06_23_45.292298_S5K.jpg
2016-12-06	06:24	Stopped again. Too hot.	18.21032	144.70736	3611	234	S5K24803.jpg
2016-12-06	06:25	Moved and still too hot.	18.21036	144.70740	3611	234	2016-12-06T06_25_05.308595_S5K.jpg
2016-12-06	06:25	Too cold.	18.21033	144.70743	3611	234	2016-12-06T06_25_41.280132_S5K.jpg
2016-12-06	06:26	Dropped to 13deg.	18.21039	144.70745	3611	234	2016-12-06T06_26_20.283612_S5K.jpg
2016-12-06	06:27	Too hot.	18.21027	144.70742	3611	234	2016-12-06T06_27_14.305492_S5K.jpg
2016-12-06	06:28	Leaving it here.	18.21031	144.70732	3611	234	2016-12-06T06_28_10.294954_S5K.jpg
2016-12-06	06:28	Came out again.	18.21033	144.70727	3611	234	2016-12-06T06_28_32.284008_S5K.jpg
2016-12-06	06:29	Around 19-20deg.	18.21051	144.70732	3611	234	2016-12-06T06_29_16.297893_S5K.jpg
2016-12-06	06:30	Temp is around 15 here.	18.21045	144.70723	3611	234	S5K25200.jpg
2016-12-06	06:33	Here is in the high 50's.	18.21024	144.70751	3611	234	2016-12-06T06_33_56.306389_S5K.jpg
2016-12-06	06:34	Crab fight to the left.	18.21022	144.70742	3611	234	S5K25434.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	06:35	Stop 06:35. Tmax=67.7 Tavg=35.2 vol=3217 T2=16.	18.21026	144.70736	3611	234	
2016-12-06	06:37	S39-HFS-08 Start 06:37. Unfiltered Piston #4 At the same location as the LVB. Near the crack with the 2 snails.	18.21031	144.70741	3611	234	S5K25603.jpg
2016-12-06	06:39	Exhaust looks good here.	18.21023	144.70730	3611	234	2016-12-06T06_39_06.314677_S5K.jpg
2016-12-06	06:41	Stop. Tmax=33.4 Tavg=26 vol=601 T2=10.	18.21028	144.70729	3611	234	
2016-12-06	06:43	S39-HFS-09 Start 06:43. Unfiltered Bag #20. Same exact location as the last one.	18.21028	144.70737	3611	234	S5K25956.jpg
2016-12-06	06:47	Stop 06:47. Tmax=40.5 Tavg=32 vol=600 T2=13.	18.21044	144.70737	3611	234	
2016-12-06	06:49	S39-HFS-10 Start 06:49. DNA Filter #10. Same exact location.	18.21042	144.70752	3611	234	S5K26301.jpg
2016-12-06	06:54	Crabs tearing each other apart.	18.21008	144.70713	3611	234	S5K26594.jpg
2016-12-06	06:58	Crabs are eating something large.	18.21031	144.70738	3611	234	2016-12-06T06_58_23.310818_S5K.jpg
2016-12-06	07:0	Crabs being cannibals.	18.21039	144.70740	3611	234	S5K26957.jpg
2016-12-06	07:0	Got his own leg to himself.	18.21046	144.70736	3611	234	2016-12-06T07_00_29.316013_S5K.jpg
2016-12-06	07:2	Nudging the wand half a centimeter back.	18.21046	144.70740	3611	234	2016-12-06T07_02_36.350213_S5K.jpg
2016-12-06	07:6	Crabs may have a mussel.	18.21030	144.70744	3611	234	S5K27317.jpg
2016-12-06	07:8	Scaleworm.	18.21016	144.70726	3611	234	2016-12-06T07_08_24.320918_S5K.jpg
2016-12-06	07:10	Robosnail.	18.21033	144.70718	3611	234	2016-12-06T07_10_40.312683_S5K.jpg
2016-12-06	07:15	Stop. Tmax=78 Tavg=42 vol=2944 T2=25. Same location.	18.21022	144.70738	3611	234	2016-12-06T07_15_33.341378_S5K.jpg
2016-12-06	07:16	Going to take some sensor readings.	18.21005	144.70738	3611	234	
2016-12-06	07:17	Taking gauge readings.	18.21013	144.70738	3611	234	2016-12-06T07_17_00.327688_S5K.jpg
2016-12-06	07:17	Taking sensor readings at the same location.	18.21015	144.70737	3611	234	
2016-12-06	07:18	Stopping sensor readings.	18.21016	144.70726	3611	234	
2016-12-06	07:18	Putting the wand away and stow the Beast.	18.21021	144.70728	3611	234	2016-12-06T07_18_20.340926_S5K.jpg
2016-12-06	07:19	Flushing the Beast.	18.21016	144.70736	3611	234	
2016-12-06	07:21	Wand is stowed. Beast is not bungeed.	18.21039	144.70733	3611	234	2016-12-06T07_21_04.341168_S5K.jpg
2016-12-06	07:22	Collecting a rock for biologists.	18.21044	144.70740	3611	234	
2016-12-06	07:24	S29-Geo-11 Rock is for Biologist Aft-port quarter of the forward biobox. Collected with an anemone on it just below the snails.	18.21047	144.70754	3611	234	2016-12-06T07_24_20.338705_S5K.jpg
2016-12-06	07:25	HD new file started.	18.21044	144.70750	3611	234	2016-12-06T07_24_59.346349_S5K.jpg
2016-12-06	07:26	Next will try to pick up a mussel.	18.21020	144.70734	3611	234	2016-12-06T07_26_16.359450_S5K.jpg
2016-12-06	07:27	S39-Bio-12 One mussel taken near the rock and last fluid sample site below the snails. Mussel was damaged while sampling. In aft-stbd quarter of forward biobox.	18.21004	144.70741	3611	234	2016-12-06T07_27_44.339526_S5K.jpg
2016-12-06	07:29	Retrieving robosnail.	18.21032	144.70732	3611	234	2016-12-06T07_29_08.323784_S5K.jpg
2016-12-06	07:29	RECOVER Robosnail with a snail hitchhiker.	18.21033	144.70733	3611	234	S5K28706.jpg
2016-12-06	07:29	Robosnail in biobox with the mussel.	18.21032	144.70733	3611	234	2016-12-06T07_29_48.330730_S5K.jpg
2016-12-06	07:30	Next want to sample the snails with the scoop.	18.21032	144.70732	3611	234	S5K28748.jpg
2016-12-06	07:32	Grabbing the scoop.	18.21028	144.70722	3611	234	2016-12-06T07_32_34.328908_S5K.jpg
2016-12-06	07:35	S39-Bio-13 Scooped once but they came out when scoop was jostled. Will try some more.	18.21041	144.70717	3611	234	

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	07:40	Looks like only one snail in the scoop so will try to get some more.	18.21028	144.70732	3611	234	2016-12-06T07_40_00.326476_S5K.jpg
2016-12-06	07:41	Several went in and some more.	18.21021	144.70731	3611	234	2016-12-06T07_41_05.343840_S5K.jpg
2016-12-06	07:43	Scooped several more and a crab.	18.21027	144.70730	3611	234	2016-12-06T07_43_12.332151_S5K.jpg
2016-12-06	07:43	Couple more. Going to put this in the biobox.	18.21039	144.70738	3611	234	2016-12-06T07_43_47.338517_S5K.jpg
2016-12-06	07:45	No snails just crabs went into the biobox.	18.21052	144.70759	3611	234	2016-12-06T07_45_36.336331_S5K.jpg
2016-12-06	07:46	Stowing the scoop. That sample went in the forward-port quadrant of the forward biobox. Taken at the same location.	18.21048	144.70762	3611	233	
2016-12-06	07:47	Scoop is in aft biobox.	18.21038	144.70747	3611	233	2016-12-06T07_47_51.340459_S5K.jpg
2016-12-06	07:48	Next will use the suction to collect some more biology.	18.21044	144.70741	3611	233	
2016-12-06	07:49	Got the vacuum hose.	18.21041	144.70741	3611	233	2016-12-06T07_49_10.352938_S5K.jpg
2016-12-06	07:49	Going to put the sample in jar 2 with the 500 mesh.	18.21041	144.70739	3611	233	
2016-12-06	07:50	Suction is on. Baby snails here.	18.21032	144.70722	3611	230	2016-12-06T07_50_42.352817_S5K.jpg
2016-12-06	07:51	S39-Bio-14 Suction sample of biology. Same location into jar #2. 500 mesh.	18.21028	144.70723	3611	230	
2016-12-06	07:52	Polychaetes and snails in the jar.	18.21019	144.70716	3611	230	2016-12-06T07_52_10.330046_S5K.jpg
2016-12-06	07:53	Crab assisted sampling of snail.	18.21022	144.70728	3611	230	2016-12-06T07_53_30.351679_S5K.jpg
2016-12-06	07:53	Another snail.	18.21018	144.70732	3611	230	2016-12-06T07_53_55.343317_S5K.jpg
2016-12-06	07:54	Even more but not getting down to the jar.	18.21023	144.70729	3611	231	2016-12-06T07_54_24.328623_S5K.jpg
2016-12-06	07:56	Indexing to jar #3.	18.21031	144.70739	3611	229	2016-12-06T07_56_20.332852_S5K.jpg
2016-12-06	07:58	Nothing into jar #3 yet. See if they come later.	18.21014	144.70735	3611	230	S5K30481.jpg
2016-12-06	08:1	Pilots and scientists are all changing.	18.21025	144.70711	3611	229	S5K30604.jpg
2016-12-06	08:3	DEPLOY: Marker 131	18.21028	144.70697	3611	229	2016-12-06T08_03_20.332168_S5K.jpg
2016-12-06	08:4	HD new file started.	18.21026	144.70688	3611	229	2016-12-06T08_04_20.357837_S5K.jpg
2016-12-06	08:6	Going to head upslope and keep surveying.	18.21016	144.70667	3611	229	S5K30933.jpg
2016-12-06	08:7	Rotating to the right so facing the slope again.	18.21037	144.70718	3609	226	S5K31007.jpg
2016-12-06	08:8	Animals are already decreasing abundance just a few meters above.	18.21041	144.70714	3608	251	2016-12-06T08_08_29.344197_S5K.jpg
2016-12-06	08:9	Some sulfides on the wall.	18.21039	144.70718	3609	338	2016-12-06T08_09_17.352347_S5K.jpg
2016-12-06	08:9	Looks like fault scarp because very steep.	18.21042	144.70723	3606	323	2016-12-06T08_09_47.348280_S5K.jpg
2016-12-06	08:10	Sulfides in front and large concentration of anemones to the right.	18.21043	144.70728	3605	344	2016-12-06T08_10_14.342488_S5K.jpg
2016-12-06	08:11	Rocks are all covered with something.	18.21048	144.70723	3599	348	S5K31250.jpg
2016-12-06	08:12	Barnacles? Anemones? Worms?	18.21050	144.70724	3599	5	S5K31279.jpg
2016-12-06	08:12	Small red one in the middle.	18.21051	144.70725	3600	352	2016-12-06T08_12_58.356755_S5K.jpg
2016-12-06	08:14	A bit of shimmering.	18.21053	144.70727	3599	340	2016-12-06T08_14_02.357112_S5K.jpg
2016-12-06	08:14	Going to continue upslope, following all the animals.	18.21053	144.70726	3598	340	S5K31420.jpg
2016-12-06	08:15	Shimmering from large cracks between boulders, very diffuse.	18.21050	144.70724	3598	347	2016-12-06T08_15_00.380339_S5K.jpg
2016-12-06	08:16	Never seen this many anemones at a hydrothermal area before.	18.21051	144.70729	3596	308	2016-12-06T08_16_32.370905_S5K.jpg
2016-12-06	08:17	Highlights on 08:13	18.21051	144.70729	3597	307	S5K31572.jpg
2016-12-06	08:17	Continuing upslope.	18.21051	144.70730	3598	308	2016-12-06T08_17_58.351786_S5K.jpg
2016-12-06	08:18	Diminishing animals.	18.21053	144.70732	3597	7	S5K31670.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	08:19	Highlights off.	18.21056	144.70740	3597	12	2016-12-06T08_19_17.350822_S5K.jpg
2016-12-06	08:19	Another big collection of anemones and smoke?	18.21057	144.70744	3597	3	2016-12-06T08_19_38.342800_S5K.jpg
2016-12-06	08:20	Milky, shimmering water. White stained rock.	18.21064	144.70753	3601	335	2016-12-06T08_20_09.349152_S5K.jpg
2016-12-06	08:21	Highlights on again.	18.21065	144.70752	3603	316	2016-12-06T08_21_09.385001_S5K.jpg
2016-12-06	08:21	This area has barnacles, mussels, crabs, squat lobsters, anemones that we can see just scanning quickly.	18.21065	144.70753	3605	309	2016-12-06T08_21_32.373990_S5K.jpg
2016-12-06	08:22	Highlights off at 08:22 but on right away again.	18.21066	144.70754	3607	297	2016-12-06T08_22_51.393140_S5K.jpg
2016-12-06	08:23	Scanning up the rock face of venting area with biology and minor smoke.	18.21065	144.70754	3606	296	2016-12-06T08_23_39.373883_S5K.jpg
2016-12-06	08:24	Also shrimp.	18.21064	144.70753	3604	294	2016-12-06T08_24_18.380811_S5K.jpg
2016-12-06	08:24	And snails.	18.21068	144.70753	3603	296	S5K32019.jpg
2016-12-06	08:25	Highlights off.	18.21071	144.70751	3599	290	2016-12-06T08_25_41.384183_S5K.jpg
2016-12-06	08:26	Going to traverse downslope now.	18.21070	144.70758	3602	265	S5K32130.jpg
2016-12-06	08:27	Concentrated vent sites every few 10s of m along this line up and down the slope.	18.21070	144.70759	3608	248	S5K32185.jpg
2016-12-06	08:27	Broken blocks at the bottom of the vertical slope.	18.21071	144.70760	3611	243	2016-12-06T08_27_51.382356_S5K.jpg
2016-12-06	08:28	Continuing downslope.	18.21072	144.70763	3613	235	S5K32261.jpg
2016-12-06	08:28	Moving slightly west to get back to the animals.	18.21066	144.70764	3613	253	S5K32280.jpg
2016-12-06	08:29	Chimney. Looks dead.	18.21061	144.70764	3614	266	2016-12-06T08_29_17.363097_S5K.jpg
2016-12-06	08:29	Chimney and rattail.	18.21058	144.70764	3612	268	2016-12-06T08_29_55.362570_S5K.jpg
2016-12-06	08:30	Coral. Anemones diminishing.	18.21056	144.70766	3617	306	1481013024605S5K32369.jpg
2016-12-06	08:31	Scattered corals and anemones and glass sponges.	18.21048	144.70767	3620	320	S5K32415.jpg
2016-12-06	08:31	Less broken pillows.	18.21040	144.70766	3621	269	2016-12-06T08_31_58.371335_S5K.jpg
2016-12-06	08:32	I.e. more intact.	18.21037	144.70767	3621	267	2016-12-06T08_32_21.383181_S5K.jpg
2016-12-06	08:32	Heading back to Snail 001 sampling area to get back to highly venting area and then downslope from there.	18.21034	144.70767	3619	269	S5K32508.jpg
2016-12-06	08:33	Contouring west.	18.21028	144.70762	3621	282	2016-12-06T08_33_33.390153_S5K.jpg
2016-12-06	08:33	Going faster.	18.21026	144.70756	3619	281	2016-12-06T08_33_54.379078_S5K.jpg
2016-12-06	08:34	Sulfides and increasing anemones.	18.21025	144.70751	3616	291	2016-12-06T08_34_12.360928_S5K.jpg
2016-12-06	08:34	See marker 131.	18.21025	144.70748	3616	290	2016-12-06T08_34_29.384611_S5K.jpg
2016-12-06	08:34	See the marker.	18.21024	144.70748	3616	292	S5K32619.jpg
2016-12-06	08:34	Going downslope from near the marker.	18.21024	144.70749	3616	292	S5K32632.jpg
2016-12-06	08:35	Marker 131.	18.21023	144.70747	3616	292	S5K32644.jpg
2016-12-06	08:36	Facing N of W, heading downslope.	18.21019	144.70744	3614	296	2016-12-06T08_36_06.377830_S5K.jpg
2016-12-06	08:36	Rattail.	18.21018	144.70736	3616	288	S5K32740.jpg
2016-12-06	08:37	Murkier here.	18.21013	144.70732	3618	290	S5K32773.jpg
2016-12-06	08:38	At 3620m.	18.21011	144.70727	3620	288	2016-12-06T08_38_00.393237_S5K.jpg
2016-12-06	08:39	At 3630m.	18.21005	144.70716	3629	290	2016-12-06T08_39_13.366621_S5K.jpg
2016-12-06	08:39	At 3635.	18.20994	144.70713	3636	291	
2016-12-06	08:40	At 3640m. Turning E and will contour at this depth.	18.20983	144.70717	3641	290	S5K32966.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	08:42	Sulfides.	18.20989	144.70733	3638	44	2016-12-06T08_42_18.391441_S5K.jpg
2016-12-06	08:42	And more anemones.	18.20993	144.70730	3639	44	S5K33100.jpg
2016-12-06	08:43	Old sulfides that we saw at the beginning of the dive. Going to head downslope.	18.20997	144.70730	3638	43	2016-12-06T08_43_02.399190_S5K.jpg
2016-12-06	08:43	A little bit of shimmer.	18.21002	144.70723	3639	44	S5K33158.jpg
2016-12-06	08:43	Deteriorating sulfides on the seafloor.	18.21003	144.70719	3640	43	2016-12-06T08_43_53.381127_S5K.jpg
2016-12-06	08:44	Last time here was less than 300°C so maybe was start of decline already then.	18.21000	144.70729	3642	40	2016-12-06T08_44_18.380865_S5K.jpg
2016-12-06	08:44	More sulfides and chimney stumps. 3646m.	18.21001	144.70727	3646	40	2016-12-06T08_44_50.377583_S5K.jpg
2016-12-06	08:45	20 years ago was diffuse venting as well. Not sure if they had high temp vents then.	18.20994	144.70733	3649	40	2016-12-06T08_45_24.380483_S5K.jpg
2016-12-06	08:47	We are going to go back to that venting area with the carpet of small anemones to get a rock to sample them.	18.20978	144.70758	3653	24	2016-12-06T08_47_01.410620_S5K.jpg
2016-12-06	08:47	Going upslope rather quickly to get rock before time to come off bottom.	18.20988	144.70763	3644	340	2016-12-06T08_47_38.379697_S5K.jpg
2016-12-06	08:48	Big one on the right.	18.20999	144.70758	3633	349	2016-12-06T08_48_11.410997_S5K.jpg
2016-12-06	08:49	Going up to 3606.	18.21013	144.70743	3621	333	S5K33485.jpg
2016-12-06	08:49	Back to marker 131.	18.21020	144.70741	3616	326	2016-12-06T08_49_19.376548_S5K.jpg
2016-12-06	08:49	Still heading upslope.	18.21028	144.70737	3610	324	2016-12-06T08_49_42.404477_S5K.jpg
2016-12-06	08:50	Sulfide area.	18.21036	144.70733	3604	318	2016-12-06T08_50_06.392690_S5K.jpg
2016-12-06	08:50	At 3600, going to head east.	18.21039	144.70730	3601	329	2016-12-06T08_50_22.405855_S5K.jpg
2016-12-06	08:51	Looks like it is below us.	18.21054	144.70749	3596	327	S5K33628.jpg
2016-12-06	08:52	Back to the venting area. Going down a bit more.	18.21060	144.70758	3602	275	2016-12-06T08_52_36.405646_S5K.jpg
2016-12-06	08:53	Now back to the left. Looking for 3599m.	18.21054	144.70755	3605	322	2016-12-06T08_53_55.387017_S5K.jpg
2016-12-06	08:55	Found the little anemones. Looking for a rock to grab.	18.21044	144.70746	3600	303	S5K33869.jpg
2016-12-06	08:56	Coralomorphs of some sort (sp?)	18.21036	144.70753	3598	304	2016-12-06T08_56_46.383566_S5K.jpg
2016-12-06	08:57	Little zooanthids.	18.21034	144.70756	3598	304	2016-12-06T08_57_21.390082_S5K.jpg
2016-12-06	08:57	Highlights on.	18.21032	144.70758	3598	304	S5K34001.jpg
2016-12-06	08:58	Positioning to grab a rock.	18.21029	144.70761	3598	303	2016-12-06T08_58_24.380294_S5K.jpg
2016-12-06	08:58	Whooh- was attached to a big rock.	18.21030	144.70764	3598	303	S5K34082.jpg
2016-12-06	09:0	Trying to get rock.	18.21046	144.70736	3598	298	2016-12-06T09_00_58.404171_S5K.jpg
2016-12-06	09:1	Fell down.	18.21046	144.70736	3598	298	
2016-12-06	09:2	Trying another one.	18.21048	144.70738	3598	298	S5K34268.jpg
2016-12-06	09:2	Piece broke off while trying to grab it.	18.21047	144.70741	3598	298	S5K34321.jpg
2016-12-06	09:3	Trying to grab it, has a big anemone on it, squished it a bit?	18.21047	144.70743	3598	298	2016-12-06T09_03_25.381997_S5K.jpg
2016-12-06	09:4	Tried another one but crumbled easily.	18.21056	144.70745	3598	298	2016-12-06T09_04_36.385169_S5K.jpg
2016-12-06	09:5	Hard to get a good grip on the rock.	18.21054	144.70747	3598	300	2016-12-06T09_05_23.399817_S5K.jpg
2016-12-06	09:5	Piece broke off.	18.21052	144.70745	3598	299	2016-12-06T09_05_43.387920_S5K.jpg
2016-12-06	09:6	Got one in the grips.	18.21052	144.70745	3598	299	S5K34511.jpg
2016-12-06	09:6	Moving towards biobox.	18.21053	144.70744	3598	299	S5K34537.jpg

Date	Time	S39 - Alice Springs - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	09:7	Rock with little zooanthids and large anemone on it. Into right forward bio box partition.	18.21055	144.70745	3598	299	S5K34596.jpg
2016-12-06	09:9	Reading gauges.	18.21066	144.70722	3578	298	2016-12-06T09_09_35.375345_S5K.jpg
2016-12-06	09:10	Starting to ascend. Putting bungee on HFS.	18.21065	144.70724	3564	300	2016-12-06T09_10_06.375596_S5K.jpg
2016-12-06	09:13	HD off.	18.21059	144.70735	3451	299	2016-12-06T09_13_20.391913_S5K.jpg

Table 6.6-6 Dive S40 – Burke Field

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
Date	time	Observation	Latitude	Longitude	Depth	Heading	File
2016-12-06	23:23	Pilots have spotted the bottom.	18.18106	144.72015	3678	357	1481066599040S5K08462.jpg
2016-12-06	23:23	Already we can see anemones.	18.18106	144.72015	3683	357	2016-12-06T23_23_33.810129_S5K.jpg
2016-12-06	23:23	Pillow lavas with some staining and anemones.	18.18105	144.72015	3690	356	1481066633185S5K08496.jpg
2016-12-06	23:24	Squat lobsters and some shimmering water.	18.18106	144.72015	3692	355	2016-12-06T23_24_12.815076_S5K.jpg
2016-12-06	23:24	Cans see smaller biology on some of the rock faces. Steep hill.	18.18106	144.72015	3691	354	2016-12-06T23_24_35.803834_S5K.jpg
2016-12-06	23:25	Crab and maybe some limpets in the shimmer.	18.18106	144.72014	3694	355	1481066713167S5K08576.jpg
2016-12-06	23:25	Probably on the edge of venting or in very diffuse flow.	18.18108	144.72015	3694	355	1481066732031S5K08595.jpg
2016-12-06	23:25	Going to move upslope to map out the extent of venting. Heading for the Sentry MAPR ORP target which indicated possible high-temperature venting (black smoker?).	18.18109	144.72015	3693	355	2016-12-06T23_25_52.811760_S5K.jpg
2016-12-06	23:26	Rocks do have staining where the anemones are living.	18.18114	144.72014	3692	355	2016-12-06T23_26_29.814128_S5K.jpg
2016-12-06	23:27	Moving upslope.	18.18119	144.72014	3690	355	2016-12-06T23_27_19.798919_S5K.jpg
2016-12-06	23:27	Pillow lava slope with lava tubes. Less anemones.	18.18120	144.72013	3690	355	2016-12-06T23_27_30.815598_S5K.jpg
2016-12-06	23:28	There are a few squat lobsters. Long pillows.	18.18123	144.72014	3689	355	2016-12-06T23_28_01.808768_S5K.jpg
2016-12-06	23:28	Shrimp.	18.18126	144.72014	3687	354	2016-12-06T23_28_31.810572_S5K.jpg
2016-12-06	23:28	Quite a bit of staining on the rocks.	18.18127	144.72014	3686	354	1481066928296S5K08791.jpg
2016-12-06	23:29	Not seeing any anemones.	18.18128	144.72014	3686	0	1481066967064S5K08830.jpg
2016-12-06	23:29	Striations on the pillow and stalked corals.	18.18129	144.72013	3685	1	2016-12-06T23_29_48.815670_S5K.jpg
2016-12-06	23:31	Quite a few squat lobsters but no anemones.	18.18134	144.72012	3681	359	2016-12-06T23_31_02.827414_S5K.jpg
2016-12-06	23:31	Backing off the slope to get a wider view.	18.18137	144.72011	3677	359	2016-12-06T23_31_38.822957_S5K.jpg
2016-12-06	23:32	Moving slightly to stbd as climbing up the slope.	18.18139	144.72013	3676	359	2016-12-06T23_32_06.814626_S5K.jpg
2016-12-06	23:32	Still seeing the squat lobsters.	18.18144	144.72013	3676	0	2016-12-06T23_32_29.799522_S5K.jpg
2016-12-06	23:33	There is still a slight coating on the pillows.	18.18148	144.72014	3675	0	1481067186808S5K09050.jpg
2016-12-06	23:33	Just pillows and squat lobsters.	18.18155	144.72016	3673	360	1481067231934S5K09095.jpg
2016-12-06	23:34	Going to go east-west at this depth to scan for vents.	18.18161	144.72018	3670	359	2016-12-06T23_34_38.803048_S5K.jpg
2016-12-06	23:35	Starting a zigzag to the west.	18.18161	144.72016	3670	359	2016-12-06T23_35_00.826809_S5K.jpg
2016-12-06	23:35	Still driving to port.	18.18160	144.72010	3670	331	2016-12-06T23_35_47.808175_S5K.jpg
2016-12-06	23:36	More yellow staining on the pillows.	18.18155	144.72005	3670	315	2016-12-06T23_36_50.805967_S5K.jpg
2016-12-06	23:37	Continuing to port. Squat lobsters only in the pillows.	18.18154	144.72003	3670	328	2016-12-06T23_37_10.823994_S5K.jpg
2016-12-06	23:38	Great looking pillow balls.	18.18151	144.71998	3670	338	2016-12-06T23_38_02.808097_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-06	23:38	Appears to be a lot of cloudy water behind us. Backing off to take a look.	18.18149	144.71997	3670	336	2016-12-06T23_38_22.831435_S5K.jpg
2016-12-06	23:39	There is some diffuse flow and some more biology. Crabs and limpets. Not much living here.	18.18140	144.72000	3671	5	2016-12-06T23_39_52.812723_S5K.jpg
2016-12-06	23:40	More shimmering as we move back to stbd.	18.18138	144.72004	3671	6	1481067633034S5K09496.jpg
2016-12-06	23:40	Surprisingly few animals in this flow.	18.18135	144.72005	3672	356	2016-12-06T23_40_56.810016_S5K.jpg
2016-12-06	23:41	Seeing some shrimp.	18.18139	144.72004	3673	348	1481067700007S5K09563.jpg
2016-12-06	23:42	Moving across to port.	18.18138	144.72000	3674	358	2016-12-06T23_42_26.802794_S5K.jpg
2016-12-06	23:43	Could see more in the stbd camera arm facing to the right so now heading back right. Got out of the flow when moved to the left.	18.18139	144.71996	3674	357	2016-12-06T23_43_11.810609_S5K.jpg
2016-12-06	23:43	Pockets of yellow sediment.	18.18139	144.72001	3674	1	1481067835160S5K09698.jpg
2016-12-06	23:44	Very steep with long down-reaching tubes of lava.	18.18140	144.72005	3674	2	1481067872217S5K09735.jpg
2016-12-06	23:45	Bit more squat lobsters and some shimmer but certainly not very lush.	18.18143	144.72011	3674	2	2016-12-06T23_45_44.827484_S5K.jpg
2016-12-06	23:46	Speculation that there is an excess of iron and not as much H2S.	18.18145	144.72010	3674	3	1481067968979S5K09832.jpg
2016-12-06	23:46	Going to continue to move upslope and zigzag.	18.18151	144.72014	3674	3	2016-12-06T23_46_55.797701_S5K.jpg
2016-12-06	23:48	Going to stretch out to the east first.	18.18159	144.72019	3671	3	2016-12-06T23_48_01.833236_S5K.jpg
2016-12-06	23:49	Fairly intact pillow and light yellow coating.	18.18170	144.72026	3670	311	2016-12-06T23_49_16.810739_S5K.jpg
2016-12-06	23:49	Now starting to move west (port) and up.	18.18174	144.72025	3669	309	2016-12-06T23_49_36.985645_S5K.jpg
2016-12-06	23:50	Long tube.	18.18171	144.72016	3665	314	2016-12-06T23_50_18.806014_S5K.jpg
2016-12-06	23:50	Few more squat lobsters.	18.18169	144.72007	3662	321	2016-12-06T23_50_57.812594_S5K.jpg
2016-12-06	23:51	Water looks a little murky.	18.18168	144.72003	3660	322	2016-12-06T23_51_15.829355_S5K.jpg
2016-12-06	23:51	Small line of anemones.	18.18167	144.71999	3659	325	1481068296995S5K10160.jpg
2016-12-06	23:52	Definitely a bit more murky.	18.18168	144.71995	3656	327	1481068331043S5K10194.jpg
2016-12-06	23:52	Anemones are a good sign since we are looking for Anemone Heaven.	18.18168	144.71992	3654	329	1481068354935S5K10218.jpg
2016-12-06	23:53	Moved out of the anemones so going to head back to the NE.	18.18168	144.71989	3652	329	1481068379147S5K10242.jpg
2016-12-06	23:53	Back over the anemones.	18.18173	144.71993	3650	329	2016-12-06T23_53_34.830882_S5K.jpg
2016-12-06	23:53	Seeing a concentration of anemones.	18.18175	144.71995	3648	328	2016-12-06T23_53_51.811490_S5K.jpg
2016-12-06	23:54	Anemones and hydrothermal sediments.	18.18179	144.71999	3648	329	2016-12-06T23_54_28.819918_S5K.jpg
2016-12-06	23:55	Shimmer, barnacles, anemones and crabs. This will not be too warm.	18.18181	144.72002	3647	322	2016-12-06T23_55_08.840329_S5K.jpg
2016-12-06	23:55	No snails or shrimp so it won't be too warm.	18.18182	144.72002	3647	316	1481068533244S5K10396.jpg
2016-12-06	23:56	We are 25m shallower than the old Anemone Heaven site.	18.18182	144.72002	3647	308	2016-12-06T23_56_10.835693_S5K.jpg
2016-12-06	23:56	Navigational marker put here.	18.18184	144.72003	3645	314	2016-12-06T23_56_46.827028_S5K.jpg
2016-12-06	23:57	Lots of milky discharge.	18.18186	144.72003	3645	315	2016-12-06T23_57_07.811195_S5K.jpg
2016-12-06	23:58	Crab, limpets, scaleworms and lots of anemones.	18.18186	144.72003	3645	296	2016-12-06T23_58_24.832654_S5K.jpg
2016-12-06	23:58	Not as many barnacles here if any.	18.18186	144.72003	3645	295	2016-12-06T23_58_47.825073_S5K.jpg
2016-12-06	23:59	Moving NE (stbd).	18.18187	144.72003	3645	312	2016-12-06T23_59_10.835051_S5K.jpg
2016-12-06	23:59	Following a bit of the smoke in this direction but the animals have decreased.	18.18188	144.72004	3644	332	2016-12-06T23_59_28.815861_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	00:00	Moving east.	18.18195	144.72004	3642	345	1481068823853S5K10687.jpg
2016-12-07	00:01	Not much in this direction. Going to go back west.	18.18203	144.72007	3643	346	1481068885291S5K10748.jpg
2016-12-07	00:01	Almost looked like sheet flow.	18.18203	144.72001	3644	343	2016-12-07T00_01_47.829395_S5K.jpg
2016-12-07	00:02	A couple of anemones in the distance.	18.18203	144.72000	3643	327	2016-12-07T00_02_02.843110_S5K.jpg
2016-12-07	00:02	Moving up now.	18.18202	144.72001	3642	269	1481068957064S5K10820.jpg
2016-12-07	00:03	Anemones lurking in the distance. Going after them.	18.18200	144.72000	3641	269	1481069007093S5K10870.jpg
2016-12-07	00:04	Coming up to the top of a hill at 3640 with some anemones.	18.18198	144.71998	3640	269	1481069046875S5K10910.jpg
2016-12-07	00:04	Not very dense concentration of anemones but some floc in the water.	18.18197	144.71994	3640	268	2016-12-07T00_04_36.828295_S5K.jpg
2016-12-07	00:05	Tiny stalked biology (collected yesterday) on the rocks. Looks like fuzzy rocks from the distance.	18.18196	144.71992	3639	269	1481069128185S5K10991.jpg
2016-12-07	00:06	Moving west to the larger patch of anemones and murky water.	18.18195	144.71995	3639	270	2016-12-07T00_06_43.821690_S5K.jpg
2016-12-07	00:07	Smokey water and anemones.	18.18187	144.71995	3640	269	2016-12-07T00_07_45.816780_S5K.jpg
2016-12-07	00:08	Back camera showing some smoke.	18.18185	144.71997	3641	277	1481069297137S5K11160.jpg
2016-12-07	00:08	Backing away to get a look behind us.	18.18182	144.71998	3641	289	2016-12-07T00_08_28.828000_S5K.jpg
2016-12-07	00:09	Looks like where we were before. Going to continue NW.	18.18179	144.72003	3643	301	
2016-12-07	00:09	Same milky venting.	18.18179	144.72002	3642	312	2016-12-07T00_09_16.847939_S5K.jpg
2016-12-07	00:09	Rattail.	18.18180	144.71999	3643	315	1481069387271S5K11250.jpg
2016-12-07	00:10	Up on this flat area there are less anemones and the other biology.	18.18186	144.71995	3637	318	1481069440198S5K11303.jpg
2016-12-07	00:11	Found a marker from a previous dive.	18.18189	144.71990	3639	317	1481069479092S5K11342.jpg
2016-12-07	00:11	Flat pillows and some instrument from a previous dive.	18.18194	144.71985	3639	318	2016-12-07T00_11_46.830213_S5K.jpg
2016-12-07	00:12	Actually a bottle on a rope.	18.18195	144.71984	3639	316	2016-12-07T00_12_33.853623_S5K.jpg
2016-12-07	00:13	Looks deliberately placed but no markings.	18.18195	144.71984	3639	316	1481069588329S5K11451.jpg
2016-12-07	00:13	Interesting pillows with cracked skins.	18.18195	144.71985	3639	316	2016-12-07T00_13_26.832781_S5K.jpg
2016-12-07	00:13	Continuing north on top of this flatter area.	18.18197	144.71986	3638	317	2016-12-07T00_13_57.823272_S5K.jpg
2016-12-07	00:14	A few squat lobsters here.	18.18200	144.71984	3639	317	2016-12-07T00_14_21.845438_S5K.jpg
2016-12-07	00:15	That was a zag across to the west. Now turning to go the other direction to the east up the hill in front of us.	18.18207	144.71978	3640	320	2016-12-07T00_15_14.825821_S5K.jpg
2016-12-07	00:16	Flatter pillows and squat lobsters with some smaller ones.	18.18211	144.71983	3639	51	2016-12-07T00_16_04.847135_S5K.jpg
2016-12-07	00:16	Ledges with flat lava flows.	18.18212	144.71989	3639	63	1481069815035S5K11678.jpg
2016-12-07	00:17	Slope of pillows stopping at a flat ledge.	18.18212	144.71993	3639	47	2016-12-07T00_17_14.824974_S5K.jpg
2016-12-07	00:17	A little staining on the pillows.	18.18214	144.71995	3637	43	1481069854915S5K11718.jpg
2016-12-07	00:17	Moving up a steep slope.	18.18216	144.71997	3637	41	2016-12-07T00_17_42.849916_S5K.jpg
2016-12-07	00:18	Very few squat lobsters.	18.18219	144.72001	3635	43	2016-12-07T00_18_26.834996_S5K.jpg
2016-12-07	00:18	Coming around a drop off.	18.18220	144.72002	3634	41	2016-12-07T00_18_42.860332_S5K.jpg
2016-12-07	00:19	Going to turn back west. A few lobsters on the edge.	18.18224	144.72002	3632	43	2016-12-07T00_19_04.832028_S5K.jpg
2016-12-07	00:19	More biology here.	18.18223	144.72000	3630	339	2016-12-07T00_19_50.850650_S5K.jpg
2016-12-07	00:20	More flow as the animals led the way to the venting.	18.18224	144.71999	3630	328	2016-12-07T00_20_14.838819_S5K.jpg
2016-12-07	00:21	Lots of milky flow and staining.	18.18227	144.71990	3629	337	2016-12-07T00_21_02.862731_S5K.jpg
2016-12-07	00:21	Anemones and limpets. Crab.	18.18228	144.71989	3629	347	1481070077308S5K11940.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	00:21	Shimmering water and squat lobsters. Bacterial mat.	18.18229	144.71988	3629	346	2016-12-07T00_21_44.839463_S5K.jpg
2016-12-07	00:22	Few shrimp.	18.18229	144.71988	3629	346	1481070131073S5K11994.jpg
2016-12-07	00:22	Highlights on. Shimmering vent and milky water but not very much biology.	18.18229	144.71988	3629	346	2016-12-07T00_22_28.842650_S5K.jpg
2016-12-07	00:22	Diffuse and not very extensive.	18.18229	144.71988	3629	345	2016-12-07T00_22_28.842650_S5K.jpg
2016-12-07	00:22	Lots of shimmer.	18.18230	144.71987	3629	344	1481070174926S5K12038.jpg
2016-12-07	00:23	Putting a navigational marker here & milky crack,.	18.18228	144.71989	3629	344	2016-12-07T00_23_17.860231_S5K.jpg
2016-12-07	00:24	Venting is contained into a small area.	18.18228	144.71983	3629	1	1481070270998S5K12134.jpg
2016-12-07	00:25	Little more shimmer in that patch.	18.18229	144.71980	3627	32	2016-12-07T00_25_42.844766_S5K.jpg
2016-12-07	00:26	Shrimp.	18.18231	144.71982	3628	51	2016-12-07T00_26_43.881029_S5K.jpg
2016-12-07	00:27	Came over to the left and now moving back over to the milk crack to the right.	18.18230	144.71982	3627	63	1481070459047S5K12322.jpg
2016-12-07	00:28	HD new file started. H264 has been recording blue water the whole time?	18.18227	144.71978	3625	82	2016-12-07T00_28_04.851114_S5K.jpg
2016-12-07	00:28	That's the crack.	18.18226	144.71978	3625	81	1481070492946S5K12356.jpg
2016-12-07	00:28	Going to go upslope from here.	18.18223	144.71980	3627	57	1481070518229S5K12381.jpg
2016-12-07	00:29	Highlights off.	18.18220	144.71983	3627	26	2016-12-07T00_28_59.868850_S5K.jpg
2016-12-07	00:29	Climbing up from the milky crack.	18.18220	144.71984	3626	27	2016-12-07T00_29_02.842252_S5K.jpg
2016-12-07	00:29	Climbing up along the biology.	18.18226	144.71991	3626	5	2016-12-07T00_29_42.849293_S5K.jpg
2016-12-07	00:30	Going to follow the ridge.	18.18228	144.71997	3624	2	2016-12-07T00_30_03.864168_S5K.jpg
2016-12-07	00:30	Mussels!	18.18230	144.71999	3624	21	2016-12-07T00_30_29.870319_S5K.jpg
2016-12-07	00:31	Top of little ridge with steep drop-offs to either side.	18.18233	144.72001	3622	25	2016-12-07T00_30_57.851707_S5K.jpg
2016-12-07	00:31	Milky area ahead.	18.18244	144.72012	3622	358	2016-12-07T00_31_18.837925_S5K.jpg
2016-12-07	00:31	Still no large concentrations of biology.	18.18242	144.72008	3623	350	1481070690157S5K12553.jpg
2016-12-07	00:32	Cluster of animals to the left.	18.18266	144.72023	3624	358	1481070721933S5K12585.jpg
2016-12-07	00:32	INS is wandering.	18.18275	144.72018	3627	359	2016-12-07T00_32_31.850353_S5K.jpg
2016-12-07	00:32	Stained rock with some mussels, shrimp and limpets, crabs.	18.18277	144.72016	3627	357	2016-12-07T00_32_42.863988_S5K.jpg
2016-12-07	00:32	Shrimp.	18.18280	144.72019	3627	357	2016-12-07T00_32_52.888507_S5K.jpg
2016-12-07	00:33	A few snails.	18.18278	144.72021	3627	357	1481070803360S5K12666.jpg
2016-12-07	00:33	Snails. Scaleworm, limpets.	18.18278	144.72021	3627	357	2016-12-07T00_33_24.883064_S5K.jpg
2016-12-07	00:34	Maybe 3 species of limpets, scaleworms, mussels, shrimp.	18.18254	144.72013	3627	357	2016-12-07T00_34_21.891936_S5K.jpg
2016-12-07	00:35	Shrimp have eggs underneath.	18.18255	144.72011	3628	354	2016-12-07T00_35_41.876406_S5K.jpg
2016-12-07	00:36	Taking video around the edges.	18.18253	144.72008	3627	354	1481070987280S5K12850.jpg
2016-12-07	00:36	Highlights on. Snail venting area.	18.18253	144.72006	3627	354	1481071010230S5K12873.jpg
2016-12-07	00:37	Much less iron staining here so probably more H2S.	18.18254	144.72004	3627	354	2016-12-07T00_37_08.881639_S5K.jpg
2016-12-07	00:37	H264 recording again. Don't know if the first hour was recorded properly.	18.18254	144.72003	3627	354	1481071031988S5K12895.jpg
2016-12-07	00:38	3 species of limpets thinks Verena.	18.18253	144.71994	3628	354	1481071080200S5K12943.jpg
2016-12-07	00:38	Most of the smaller biology is barnacles but there are limpets.	18.18253	144.71993	3628	354	2016-12-07T00_38_11.854333_S5K.jpg
2016-12-07	00:38	Maybe two species of shrimp.	18.18252	144.71991	3628	355	1481071117894S5K12981.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	00:38	Maybe 2 shrimp species.	18.18252	144.71991	3628	355	2016-12-07T00_38_43.853587_S5K.jpg
2016-12-07	00:38	White ovals are limpets.	18.18252	144.71991	3628	354	2016-12-07T00_38_53.859960_S5K.jpg
2016-12-07	00:39	Scaleworm is a common genus.	18.18252	144.71992	3628	354	
2016-12-07	00:41	Nav marker called 'first snails'.	18.18253	144.71993	3628	354	2016-12-07T00_41_03.863278_S5K.jpg
2016-12-07	00:41	S40-first-snail nav marker.	18.18254	144.71993	3628	355	1481071290955S5K13154.jpg
2016-12-07	00:41	Continuing up this ridge. Seeing patches of milky water.	18.18255	144.71993	3627	353	2016-12-07T00_41_53.871762_S5K.jpg
2016-12-07	00:42	Highlights off.	18.18258	144.71993	3626	352	2016-12-07T00_42_13.855712_S5K.jpg
2016-12-07	00:42	Pit with smoke coming out.	18.18260	144.71994	3627	351	2016-12-07T00_42_36.843648_S5K.jpg
2016-12-07	00:43	Lots of patches of milky fluid with animals surrounding the fluid.	18.18265	144.71995	3627	337	2016-12-07T00_43_08.831032_S5K.jpg
2016-12-07	00:44	Area covered with milky fluids.	18.18273	144.71990	3630	333	2016-12-07T00_44_03.884408_S5K.jpg
2016-12-07	00:44	Following the smokey ridge NNW.	18.18280	144.71988	3633	332	2016-12-07T00_44_40.882310_S5K.jpg
2016-12-07	00:45	Moving more to the left to stay on top of the ridge.	18.18284	144.71981	3636	322	1481071510225S5K13373.jpg
2016-12-07	00:45	Must be big offset with the Sentry bathy as we are climbing up a steep slope while heading west.	18.18285	144.71979	3635	229	2016-12-07T00_45_44.883772_S5K.jpg
2016-12-07	00:46	About a 20m offset with Sentry bathy.	18.18282	144.71980	3635	198	1481071579310S5K13442.jpg
2016-12-07	00:47	Looking south.	18.18274	144.71979	3631	167	2016-12-07T00_47_11.859923_S5K.jpg
2016-12-07	00:47	Coming up the hill while facing the south.	18.18272	144.71980	3632	169	1481071645203S5K13508.jpg
2016-12-07	00:48	Fuzzy rock here.	18.18264	144.71982	3630	169	2016-12-07T00_48_00.883418_S5K.jpg
2016-12-07	00:48	Smokey water and more anemones. Getting back to where we were.	18.18263	144.71983	3628	148	1481071698023S5K13561.jpg
2016-12-07	00:49	Here is the mussel patch.	18.18259	144.71986	3626	114	2016-12-07T00_49_00.878033_S5K.jpg
2016-12-07	00:49	Now going to spin around and go to the north.	18.18258	144.71987	3626	115	2016-12-07T00_49_15.860700_S5K.jpg
2016-12-07	00:49	Yes-we did a loop in the navigation and the nav matched!	18.18258	144.71987	3625	139	1481071770332S5K13633.jpg
2016-12-07	00:50	Spinning starboard and then going north.	18.18256	144.71989	3626	266	1481071801134S5K13664.jpg
2016-12-07	00:50	Keep spinning around and then drive north.	18.18253	144.71986	3626	305	2016-12-07T00_50_20.850009_S5K.jpg
2016-12-07	00:51	Smoke to the right (into the slope) as we head north.	18.18257	144.71986	3627	358	1481071861088S5K13724.jpg
2016-12-07	00:51	Driving through smoke and now the bottom is dropping away as we go downslope.	18.18260	144.71986	3626	359	1481071887028S5K13750.jpg
2016-12-07	00:52	Following the anemones down the slope.	18.18270	144.71985	3630	356	1481071947035S5K13810.jpg
2016-12-07	00:53	Animal density decreasing down the slope.	18.18280	144.71981	3635	357	2016-12-07T00_53_21.873588_S5K.jpg
2016-12-07	00:54	Down the hill with large pillow lavas and tubes. Few squat lobsters.	18.18295	144.71983	3640	357	2016-12-07T00_54_25.880375_S5K.jpg
2016-12-07	00:55	We have been moving north and downslope but are running out of tether.	18.18309	144.71990	3641	357	2016-12-07T00_55_53.900380_S5K.jpg
2016-12-07	00:56	Going to move the ship 30m to the north.	18.18314	144.71992	3645	358	1481072175996S5K14039.jpg
2016-12-07	00:56	Looks like there are no animals so out of the venting area. Stopping the trek north. Stop the ship moving north.	18.18322	144.71994	3650	358	2016-12-07T00_56_45.883948_S5K.jpg
2016-12-07	00:57	Spinning stbd to head south.	18.18323	144.71996	3650	260	1481072234192S5K14097.jpg
2016-12-07	00:57	Steep slope of intact pillows.	18.18320	144.71992	3649	172	2016-12-07T00_57_36.904404_S5K.jpg
2016-12-07	00:58	Almost made it to waypoint #5.	18.18313	144.71994	3643	171	2016-12-07T00_58_16.881532_S5K.jpg
2016-12-07	00:58	Moving south along a steep pillow slope. Not much biology at all.	18.18309	144.71992	3643	179	2016-12-07T00_58_37.902718_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	00:59	Staining.	18.18302	144.71992	3641	179	2016-12-07T00_59_10.899276_S5K.jpg
2016-12-07	00:59	Looks like a little sulfide.	18.18299	144.71990	3641	178	2016-12-07T00_59_27.887641_S5K.jpg
2016-12-07	00:59	Getting into some squat lobster with anemones in the distance. Milky water.	18.18297	144.71990	3640	178	2016-12-07T00_59_42.894375_S5K.jpg
2016-12-07	01:00	About 40m north of the concentrated venting.	18.18293	144.71988	3640	178	2016-12-07T01_00_10.887480_S5K.jpg
2016-12-07	01:00	More anemones.	18.18287	144.71986	3641	184	2016-12-07T01_00_32.886823_S5K.jpg
2016-12-07	01:02	Seeing some smaller animals.	18.18274	144.71991	3635	195	1481072522938S5K14386.jpg
2016-12-07	01:02	Crest of ridge.	18.18268	144.71991	3628	218	2016-12-07T01_02_44.882359_S5K.jpg
2016-12-07	01:03	Looks like the small peak in the fluid we observed earlier. Going to spin around to get the same heading to the east.	18.18268	144.71986	3626	183	2016-12-07T01_03_30.894482_S5K.jpg
2016-12-07	01:04	Moving in for sampling.	18.18262	144.71979	3625	88	1481072660054S5K14523.jpg
2016-12-07	01:04	Highlights on as approach area.	18.18258	144.71980	3625	48	1481072697132S5K14560.jpg
2016-12-07	01:04	Want to set up for where the snails are (hottest water indicators).	18.18258	144.71980	3625	49	2016-12-07T01_04_58.881805_S5K.jpg
2016-12-07	01:06	Coming in to where the snails are clustered.	18.18260	144.71983	3627	18	2016-12-07T01_06_17.908586_S5K.jpg
2016-12-07	01:10	Going to turn out some lights.	18.18259	144.71986	3630	2	1481073033146S5K14896.jpg
2016-12-07	01:11	Highlights off while we get set up in this spot.	18.18259	144.71987	3630	5	1481073062192S5K14925.jpg
2016-12-07	01:12	Getting the suction ready. Will suction snails and particulates first.	18.18257	144.71989	3630	1	2016-12-07T01_12_02.911271_S5K.jpg
2016-12-07	01:12	White balance.	18.18257	144.71988	3630	2	2016-12-07T01_12_40.894600_S5K.jpg
2016-12-07	01:14	Flush suction sampler.	18.18257	144.71989	3630	3	1481073247204S5K15110.jpg
2016-12-07	01:18	Pilots trying to set up for sampling.	18.18253	144.71992	3630	2	2016-12-07T01_18_19.897381_S5K.jpg
2016-12-07	01:18	Have the ROV probe.	18.18252	144.71992	3630	2	2016-12-07T01_18_39.889133_S5K.jpg
2016-12-07	01:19	Temp...6.10.....	18.18252	144.71994	3630	2	2016-12-07T01_19_44.887426_S5K.jpg
2016-12-07	01:20	High was 26.07.....27.10....27.25	18.18251	144.71994	3630	2	2016-12-07T01_20_28.892324_S5K.jpg
2016-12-07	01:21	Moving probe.	18.18251	144.71995	3630	2	
2016-12-07	01:23	Can't see the tip but up to 23deg.	18.18249	144.72000	3630	3	1481073787156S5K15650.jpg
2016-12-07	01:23	40.15....	18.18250	144.71999	3630	3	1481073804183S5K15667.jpg
2016-12-07	01:24	40deg in that spot.	18.18254	144.71994	3630	3	2016-12-07T01_24_36.895809_S5K.jpg
2016-12-07	01:25	Good spot for Julie water sample.	18.18255	144.71992	3630	3	2016-12-07T01_25_01.922525_S5K.jpg
2016-12-07	01:25	Moving down to the cluster of snails.	18.18256	144.71992	3630	3	2016-12-07T01_25_20.912190_S5K.jpg
2016-12-07	01:26	30deg....now going down.	18.18258	144.71991	3630	3	2016-12-07T01_26_36.915894_S5K.jpg
2016-12-07	01:27	Moving a bit upslope.	18.18257	144.71991	3630	3	
2016-12-07	01:27	Just a tiny bit up in the snail pile.	18.18257	144.71991	3630	3	
2016-12-07	01:27	Too cold...12deg.	18.18258	144.71988	3630	3	2016-12-07T01_27_53.925504_S5K.jpg
2016-12-07	01:28	Came up to 25 but pulled out.	18.18259	144.71989	3630	3	2016-12-07T01_28_28.924204_S5K.jpg
2016-12-07	01:28	16.55 here.	18.18259	144.71988	3630	3	2016-12-07T01_28_51.913368_S5K.jpg
2016-12-07	01:29	Lots of floc coming out.	18.18259	144.71988	3630	3	2016-12-07T01_29_07.895540_S5K.jpg
2016-12-07	01:29	26.37.....here	18.18260	144.71988	3630	3	2016-12-07T01_29_22.912767_S5K.jpg
2016-12-07	01:30	26deg site.	18.18259	144.71988	3630	3	2016-12-07T01_30_08.924657_S5K.jpg
2016-12-07	01:30	33....37....39....44.....45.....447.11....	18.18258	144.71989	3630	3	2016-12-07T01_30_48.898417_S5K.jpg
2016-12-07	01:32	HD new file started.	18.18258	144.71988	3630	3	1481074341295S5K16204.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	01:32	End of temp measurements. Got a high of 48. Will want to deploy robo-snail next. Discussing where to put it.	18.18258	144.71988	3630	3	
2016-12-07	01:36	Stowing temp probe.	18.18259	144.71985	3630	3	
2016-12-07	01:36	Grabbing robo-snail.	18.18260	144.71983	3630	3	2016-12-07T01_36_31.903309_S5K.jpg
2016-12-07	01:37	Deploying robo-snail.	18.18259	144.71984	3630	2	2016-12-07T01_37_07.911080_S5K.jpg
2016-12-07	01:37	Highlights on while deploy robosnail.	18.18260	144.71983	3630	2	1481074644247S5K16507.jpg
2016-12-07	01:37	Robo-snail	18.18260	144.71983	3630	2	1481074648213S5K16511.jpg
2016-12-07	01:38	DEPLOY robo-snail	18.18263	144.71980	3630	3	2016-12-07T01_38_06.908404_S5K.jpg
2016-12-07	01:38	Going to suction sample next.	18.18259	144.71985	3630	3	2016-12-07T01_38_56.918031_S5K.jpg
2016-12-07	01:40	Highlights off.	18.18255	144.71989	3630	3	2016-12-07T01_40_43.930597_S5K.jpg
2016-12-07	01:40	Rotating to suction jar #4.	18.18255	144.71989	3630	3	2016-12-07T01_40_57.918402_S5K.jpg
2016-12-07	01:41	Highlights on for suction sampling.	18.18254	144.71991	3630	3	2016-12-07T01_41_53.934807_S5K.jpg
2016-12-07	01:41	S40-Bio-01 Suction sample of shrimp into jar 4	18.18254	144.71991	3630	3	2016-12-07T01_41_53.934807_S5K.jpg
2016-12-07	01:43	Some shrimp have eggs.	18.18256	144.71990	3630	3	2016-12-07T01_43_20.923251_S5K.jpg
2016-12-07	01:44	Mostly like Chorocaris vandoveri	18.18256	144.71990	3630	3	2016-12-07T01_44_01.934935_S5K.jpg
2016-12-07	01:45	Collecting shrimp right around robo-snail.	18.18258	144.71990	3630	3	1481075105078S5K16968.jpg
2016-12-07	01:46	About 15 snails in the jar #4.	18.18258	144.71989	3630	2	2016-12-07T01_46_50.929816_S5K.jpg
2016-12-07	01:47	Suctioning shrimp not snails.	18.18258	144.71989	3630	2	1481075260977S5K17124.jpg
2016-12-07	01:48	Indexing to jar 3 with the 500micron mesh.	18.18258	144.71989	3630	2	
2016-12-07	01:48	End highlights	18.18258	144.71989	3630	2	
2016-12-07	01:48	Going to suction around the sample site with the robosnail but not disturbing that site.	18.18258	144.71990	3630	2	2016-12-07T01_48_54.921144_S5K.jpg
2016-12-07	01:50	S40-Bio-02 Suctioning to the left of the robosnail.	18.18257	144.71992	3630	2	1481075410362S5K17273.jpg
2016-12-07	01:52	Scaleworm went up the hose. See it in the jar.	18.18252	144.71993	3630	2	2016-12-07T01_51_59.930622_S5K.jpg
2016-12-07	01:52	Moving closer and in front of the robosnail.	18.18253	144.71992	3630	2	2016-12-07T01_52_29.936053_S5K.jpg
2016-12-07	01:53	Shrimp and crab in jar #3.	18.18252	144.71992	3630	2	
2016-12-07	01:53	Looks like limpets in the jar.	18.18253	144.71993	3630	3	1481075627968S5K17491.jpg
2016-12-07	01:54	Cracked mussel feast for the shrimp.	18.18253	144.71994	3630	2	2016-12-07T01_54_32.925772_S5K.jpg
2016-12-07	01:54	Highlights on midway during suction sample 2 of meio-fauna.	18.18255	144.71994	3630	2	2016-12-07T01_54_58.920033_S5K.jpg
2016-12-07	01:56	Suctioning up the crud.	18.18257	144.71991	3630	2	2016-12-07T01_56_04.923361_S5K.jpg
2016-12-07	01:56	Mussel has a lot of limpets on it. Sample later.	18.18254	144.71985	3630	2	2016-12-07T01_56_54.930496_S5K.jpg
2016-12-07	01:57	Debris from rock move.	18.18254	144.71987	3630	2	1481075851988S5K17715.jpg
2016-12-07	01:57	More rock movement and white stuff.	18.18256	144.71988	3630	2	2016-12-07T01_57_51.931740_S5K.jpg
2016-12-07	01:57	Highlights off.	18.18256	144.71988	3630	2	2016-12-07T01_57_55.932641_S5K.jpg
2016-12-07	01:58	Done suctioning.	18.18257	144.71989	3630	2	
2016-12-07	01:58	Indexing the jar to #2.	18.18258	144.71990	3630	2	
2016-12-07	01:59	Moving jars to #8.	18.18258	144.71989	3630	3	2016-12-07T01_59_08.935863_S5K.jpg
2016-12-07	01:59	Shrimp are feasting on broken mussel while preparing for mussel sample.	18.18259	144.71988	3630	3	2016-12-07T01_59_26.919928_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	01:59	Vacuuming the mussel but not strong enough to pull it up as it is attached to the bottom with its threads.	18.18259	144.71988	3630	2	2016-12-07T01_59_51.943283_S5K.jpg
2016-12-07	02:01	Move the hose to the biobox to get the sample in the box.	18.18260	144.71987	3630	2	
2016-12-07	02:01	Moving over the forward biobox to put it in.	18.18259	144.71986	3630	2	2016-12-07T02_01_34.950595_S5K.jpg
2016-12-07	02:02	S40-Bio-03 Suction hold of a mussel and then extruded into the forward-stbd portion of the forward biobox.	18.18259	144.71989	3630	2	2016-12-07T02_02_35.938045_S5K.jpg
2016-12-07	02:03	Next will try to find a rock without barnacles.	18.18260	144.71989	3630	2	2016-12-07T02_03_46.945156_S5K.jpg
2016-12-07	02:04	All these samples are from around the robosnail at the Snail pit site.	18.18259	144.71990	3630	2	
2016-12-07	02:04	Want that rock.	18.18260	144.71989	3630	2	2016-12-07T02_04_51.947430_S5K.jpg
2016-12-07	02:05	Not going for that rock because it could destabilize the robosnail.	18.18259	144.71989	3630	2	
2016-12-07	02:05	Moving over to the right.	18.18259	144.71990	3630	2	2016-12-07T02_05_46.929815_S5K.jpg
2016-12-07	02:06	Trying for the rock behind the crab.	18.18260	144.71989	3630	3	1481076379037S5K18242.jpg
2016-12-07	02:07	S40-Geo-04 Rock with biology for Verena. To the right of the robosnail. Had limpets on it. Went into the aft-stbd quadrant of the forward biobox.	18.18259	144.71989	3630	2	2016-12-07T02_07_57.922797_S5K.jpg
2016-12-07	02:09	Retrieving the HFS wand from the basket for water samples.	18.18258	144.71990	3630	2	1481076556446S5K18419.jpg
2016-12-07	02:17	Starting on the edge of the snails.	18.18250	144.71988	3630	2	1481077034996S5K18898.jpg
2016-12-07	02:17	Looks good here.	18.18252	144.71988	3630	2	2016-12-07T02_17_42.930382_S5K.jpg
2016-12-07	02:18	18deg water here and climbing.	18.18253	144.71989	3630	2	2016-12-07T02_18_03.922486_S5K.jpg
2016-12-07	02:18	First doing a sensor reading.	18.18253	144.71989	3630	2	2016-12-07T02_18_39.922618_S5K.jpg
2016-12-07	02:19	Framegrab for this sensor reading.	18.18256	144.71992	3630	2	1481077178035S5K19041.jpg
2016-12-07	02:19	pH is dropping from 8.2 to 6.3	18.18256	144.71992	3630	2	2016-12-07T02_19_51.923226_S5K.jpg
2016-12-07	02:20	Reading Temp=23°C pH=6.28 O2=2.0 ml/l to the right of the robosnail on the edge of the white.	18.18256	144.71991	3630	2	1481077209159S5K19072.jpg
2016-12-07	02:21	Going to take another reading about half the distance toward the robosnail.	18.18256	144.71992	3630	2	2016-12-07T02_21_00.928808_S5K.jpg
2016-12-07	02:21	Slight disturbance of the rocks.	18.18257	144.71992	3630	2	2016-12-07T02_21_39.929707_S5K.jpg
2016-12-07	02:21	Taking sensor readings.	18.18257	144.71992	3630	2	2016-12-07T02_21_54.911608_S5K.jpg
2016-12-07	02:23	Actually cooler here.	18.18257	144.71987	3630	2	2016-12-07T02_23_09.919863_S5K.jpg
2016-12-07	02:23	Temp=15.5 pH=6.51 O2=2.15 ml/l.	18.18257	144.71987	3630	2	2016-12-07T02_23_25.938567_S5K.jpg
2016-12-07	02:23	Moving wand to front of the robosnail.	18.18257	144.71989	3630	2	
2016-12-07	02:24	Bumped the rocks and moved the snail.	18.18256	144.71988	3630	2	1481077478230S5K19341.jpg
2016-12-07	02:25	Position looks good here.	18.18255	144.71989	3630	2	2016-12-07T02_25_04.933990_S5K.jpg
2016-12-07	02:25	Shimmer looks strongest along a crack where first started the sensor reading and then moving back behind the robosnail.	18.18253	144.71989	3630	2	1481077541119S5K19404.jpg
2016-12-07	02:26	Temp=16 pH=6.4 O2=2.24 ml/l.	18.18251	144.71988	3630	2	1481077596171S5K19459.jpg
2016-12-07	02:27	Going to move it again. Want to move behind the robosnail in the shimmer by the crab.	18.18251	144.71989	3630	2	
2016-12-07	02:28	Lower temp here.	18.18249	144.71985	3630	2	1481077710370S5K19573.jpg
2016-12-07	02:29	Not taking a reading here as it is not stable.	18.18250	144.71987	3630	2	

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	02:29	Moving toward the laser dot.	18.18251	144.71988	3630	2	2016-12-07T02_29_51.921768_S5K.jpg
2016-12-07	02:30	HD new file started.	18.18252	144.71989	3630	2	2016-12-07T02_30_10.945046_S5K.jpg
2016-12-07	02:30	Temp 31deg and going up.	18.18254	144.71990	3631	2	1481077846149S5K19709.jpg
2016-12-07	02:31	Stabilizing at 36deg.	18.18256	144.71990	3631	2	1481077890002S5K19753.jpg
2016-12-07	02:31	Temp is going up again....41....	18.18256	144.71991	3630	2	2016-12-07T02_31_56.916495_S5K.jpg
2016-12-07	02:32	41.9 was the max temperature and now going back down while stable in this position.	18.18258	144.71991	3631	2	2016-12-07T02_32_42.929888_S5K.jpg
2016-12-07	02:33	Temperature=35deg pH=5.98 O2=1.51 ml/l. Temp is now rising.	18.18258	144.71991	3631	2	2016-12-07T02_33_09.922165_S5K.jpg
2016-12-07	02:33	Temp 33-42 at this spot.	18.18259	144.71991	3630	2	2016-12-07T02_33_43.918808_S5K.jpg
2016-12-07	02:34	Want to move left just about an inch.	18.18259	144.71991	3630	2	1481078041082S5K19904.jpg
2016-12-07	02:35	Temp is 39...40....41...42...slowly climbing.	18.18258	144.71992	3630	2	2016-12-07T02_35_15.910819_S5K.jpg
2016-12-07	02:36	Temp=45.0 pH=5.79 O2=1.21 ml/l.	18.18258	144.71992	3630	2	2016-12-07T02_36_03.919728_S5K.jpg
2016-12-07	02:37	Stopping the sensors.	18.18258	144.71986	3630	2	
2016-12-07	02:38	Going to take water samples at this exact spot.	18.18256	144.71988	3630	2	2016-12-07T02_38_13.919920_S5K.jpg
2016-12-07	02:38	S40-HFS-05 Start 02:38. Filtered Piston #1. At the exact location of the last sensor reading just a few inches to the right of the robosnail. Not seeing exhaust flow.	18.18253	144.71987	3630	2	2016-12-07T02_38_57.931242_S5K.jpg
2016-12-07	02:40	Not looking like any exhaust coming out of the pump.	18.18255	144.71987	3630	2	
2016-12-07	02:41	Stopped and started the pump to see if that made a difference. No flow.	18.18256	144.71988	3630	2	
2016-12-07	02:42	Stop. Tmax=51.5 Tavg=50.7 vol=569 T2=19.	18.18259	144.71987	3630	2	
2016-12-07	02:42	Sample probably wasn't good.	18.18261	144.71986	3630	2	
2016-12-07	02:43	S40-HFS-06 Start 02:43 Unfiltered Piston #2. Not seeing any flow. Same exact location.	18.18260	144.71985	3630	2	2016-12-07T02_43_08.912108_S5K.jpg
2016-12-07	02:44	Taking a few framegrabs around the area while sampling.	18.18256	144.71987	3631	2	2016-12-07T02_44_48.909373_S5K.jpg
2016-12-07	02:45	Sensors are fine so could be the exhaust tube is disconnected.	18.18254	144.71988	3631	2	1481078737172S5K20600.jpg
2016-12-07	02:46	Testing to see if letting it fill if it stops on its own when completely filled.	18.18253	144.71989	3631	2	1481078797345S5K20660.jpg
2016-12-07	02:47	Stop. Tmax=49.8 Tavg=39.7 vol=872 Did not stop on its own so probably no good.	18.18255	144.71990	3631	2	2016-12-07T02_47_42.919819_S5K.jpg
2016-12-07	02:48	The navigation markers here are called &"first-snail";.	18.18254	144.71990	3631	2	
2016-12-07	02:49	S40-HFS-07 Start 02:49. Unfiltered Bag #22 There is flow in the exhaust. Same exact location to the right of the robosnail.	18.18255	144.71992	3631	2	2016-12-07T02_49_21.919110_S5K.jpg
2016-12-07	02:50	This site is being referred to as &"snail pit"; and is near the &"milky-crack"; at the &snail snail; navigational marker. We will put a physical marker here before leaving.	18.18256	144.71992	3631	2	2016-12-07T02_50_44.940110_S5K.jpg
2016-12-07	02:52	Spot on the crab.	18.18256	144.71991	3631	2	2016-12-07T02_52_00.947507_S5K.jpg
2016-12-07	02:52	Stop. Tmax=42.2 Tavg=39.4 vol=400 T2=16.	18.18256	144.71991	3631	2	
2016-12-07	02:53	S40-HFS-08 Start 02:53. Filtered Bag #21. Can see flow/exhaust. Same location.	18.18256	144.71990	3631	2	2016-12-07T02_53_04.947180_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	02:54	Taking video highlights and framegrabs while sampling.	18.18256	144.71989	3631	2	2016-12-07T02_54_09.944662_S5K.jpg
2016-12-07	02:54	Not taking highlights just regular video survey.	18.18256	144.71990	3631	2	2016-12-07T02_54_52.961397_S5K.jpg
2016-12-07	02:56	Stop. Tmax=47.2 Tavg=43.6 vol=400 T2=16.17	18.18258	144.71987	3631	2	2016-12-07T02_56_19.941016_S5K.jpg
2016-12-07	02:58	Does the nozzle need to go down.	18.18255	144.71991	3631	2	2016-12-07T02_58_15.944524_S5K.jpg
2016-12-07	02:58	Looks ok.	18.18252	144.71988	3631	2	2016-12-07T02_58_47.943833_S5K.jpg
2016-12-07	02:59	S40-HFS-09 Start 02:59. LVB #24 at the same location. Good flow in exhaust.	18.18250	144.71988	3631	2	2016-12-07T02_59_35.922594_S5K.jpg
2016-12-07	03:08	Zooming in on the small snail that looks different than all the others we have seen.	18.18255	144.71991	3631	2	2016-12-07T03_08_12.952759_S5K.jpg
2016-12-07	03:08	Maximum zoom right now. and a lot of shimmer.	18.18255	144.71992	3631	2	1481080124980S5K21988.jpg
2016-12-07	03:09	It is a different species than the other ones we have been observing. Believe it was collected the other day in a sample.	18.18256	144.71993	3631	2	2016-12-07T03_09_10.940035_S5K.jpg
2016-12-07	03:18	Clearer view of the dark snail.	18.18254	144.71996	3631	2	2016-12-07T03_18_55.956578_S5K.jpg
2016-12-07	03:22	Stop 03:22 Tmax=49.5 Tavg=42.7 vol=3318 T2=17.	18.18253	144.71989	3631	2	2016-12-07T03_22_13.953050_S5K.jpg
2016-12-07	03:22	Highlights on for a bit of fauna.	18.18255	144.71988	3630	2	2016-12-07T03_22_46.950594_S5K.jpg
2016-12-07	03:22	Switching to a DNA filter.	18.18255	144.71987	3631	2	
2016-12-07	03:24	S40-HFS-10 Start 03:24. RNA Filter #11 At the same location.	18.18251	144.71983	3631	2	1481081051099S5K22914.jpg
2016-12-07	03:25	Getting pulled a bit by the tether.	18.18252	144.71987	3630	2	2016-12-07T03_25_28.947840_S5K.jpg
2016-12-07	03:26	Wand looks fine in this location.	18.18253	144.71986	3631	2	2016-12-07T03_26_13.937633_S5K.jpg
2016-12-07	03:26	Highlights off	18.18253	144.71987	3631	2	2016-12-07T03_26_19.916594_S5K.jpg
2016-12-07	03:26	Doesn't look like it moved.	18.18253	144.71987	3631	2	
2016-12-07	03:30	HD new file started.	18.18253	144.71992	3631	2	2016-12-07T03_30_27.926814_S5K.jpg
2016-12-07	03:36	Highlights on, barnacle cirri out.	18.18255	144.71988	3631	2	2016-12-07T03_36_24.965839_S5K.jpg
2016-12-07	03:46	Highlights off.	18.18256	144.71990	3631	2	2016-12-07T03_46_06.941841_S5K.jpg
2016-12-07	03:46	ROV moved a bit and temp went up on probe.	18.18256	144.71990	3631	2	2016-12-07T03_46_20.953392_S5K.jpg
2016-12-07	03:47	Highlights on again.	18.18257	144.71990	3631	2	2016-12-07T03_47_07.931184_S5K.jpg
2016-12-07	03:49	A different white snail.	18.18260	144.71992	3631	2	2016-12-07T03_49_02.937871_S5K.jpg
2016-12-07	03:50	Highlights off.	18.18259	144.71991	3631	2	2016-12-07T03_50_07.947978_S5K.jpg
2016-12-07	03:50	Stop 03:50 Tmax=48.8 Tavg=37.4 vol=3000 T2=17 (High temp occurred just at end).	18.18256	144.71991	3631	2	1481082637381S5K24500.jpg
2016-12-07	03:52	At Piston #1 and checking the exhaust.	18.18254	144.71989	3631	2	
2016-12-07	03:53	Piston #1 is not working again.	18.18253	144.71988	3631	2	
2016-12-07	03:54	S40-HFS-11 Start 03:54. Unfiltered Piston #8 Seeing good exhaust. Same location to the right of the robosnail.	18.18251	144.71987	3631	2	1481082855176S5K24718.jpg
2016-12-07	03:58	Stop 03:58 Tmax=48.7 Tavg=45.5 vol=650 T2=17 Good sample.	18.18248	144.71991	3631	2	2016-12-07T03_58_52.942159_S5K.jpg
2016-12-07	04:02	Done with sensor readings on HFS, putting it away.	18.18255	144.71992	3631	2	2016-12-07T04_02_20.953998_S5K.jpg
2016-12-07	04:02	Done with the HFS sampler here.	18.18255	144.71993	3630	2	
2016-12-07	04:03	Next the robosnail needs to be retrieved and a sample of snails to be taken.	18.18254	144.71993	3631	2	1481083393286S5K25256.jpg
2016-12-07	04:03	Stowing the HFS wand.	18.18253	144.71993	3630	2	2016-12-07T04_03_53.978494_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	04:04	Wand is in the holster.	18.18252	144.71997	3631	2	2016-12-07T04_04_39.960587_S5K.jpg
2016-12-07	04:05	Retrieving the robosnail.	18.18253	144.71994	3631	2	2016-12-07T04_05_29.975417_S5K.jpg
2016-12-07	04:05	RECOVER Robosnail with a couple of snails attached.	18.18254	144.71993	3631	2	2016-12-07T04_05_48.960604_S5K.jpg
2016-12-07	04:06	Putting the Robosnail in the forward-stbd quadrant with the mussel sample.	18.18257	144.71996	3631	2	2016-12-07T04_06_16.952956_S5K.jpg
2016-12-07	04:07	S40-Bio-12 Sample of snails hitchhiking on the robosnail.	18.18257	144.71994	3631	2	2016-12-07T04_07_05.971840_S5K.jpg
2016-12-07	04:08	S40-Bio-13 Suction of snails that were located under the Robosnail into Jar #7.	18.18255	144.71994	3631	360	1481083688449S5K25551.jpg
2016-12-07	04:09	Looks like over a dozen snails into the sampler.	18.18257	144.71992	3631	360	1481083741002S5K25604.jpg
2016-12-07	04:09	Bunch more came into the jar. Up to 18 and want 30.	18.18259	144.71993	3631	360	2016-12-07T04_09_18.966892_S5K.jpg
2016-12-07	04:09	Highlights on, suction snails.	18.18261	144.71994	3631	360	2016-12-07T04_09_57.967569_S5K.jpg
2016-12-07	04:10	4 more into the jar.	18.18259	144.71993	3631	360	1481083819280S5K25682.jpg
2016-12-07	04:10	A few shrimp came in as well. Looks like a great sample. Index it to #8.	18.18258	144.71993	3631	360	2016-12-07T04_10_38.975342_S5K.jpg
2016-12-07	04:11	Retrieving a marker from the basket.	18.18255	144.71988	3631	360	2016-12-07T04_11_28.958956_S5K.jpg
2016-12-07	04:11	Highlights off.	18.18255	144.71988	3631	360	1481083890317S5K25753.jpg
2016-12-07	04:11	Marker 234 coming out of the basket.	18.18254	144.71988	3631	360	2016-12-07T04_11_44.969581_S5K.jpg
2016-12-07	04:12	DEPLOY Mkr-234 at the snail pit site where the Robosnail was deployed and all these lovely samples were taken. Heading was due north at 3630m. This side of the rock is the higher temperature flow. The milky crack area is just behind the ROV. Visible on the back camera.	18.18251	144.71984	3631	360	1481083971203S5K25834.jpg
2016-12-07	04:14	View of the marker chain.	18.18252	144.71985	3631	0	2016-12-07T04_14_09.955114_S5K.jpg
2016-12-07	04:14	Anchor is very near the sampling site.	18.18252	144.71986	3630	1	2016-12-07T04_14_29.975386_S5K.jpg
2016-12-07	04:14	Coming off the bottom and going to maneuver around to the milky fluid.	18.18253	144.71986	3630	1	2016-12-07T04_14_42.955548_S5K.jpg
2016-12-07	04:15	Coming up and backing away from the site.	18.18253	144.71986	3628	2	1481084116147S5K25979.jpg
2016-12-07	04:16	Looking for the big crack with the milky fluid.	18.18255	144.71992	3626	152	
2016-12-07	04:16	Visible in pilot cam.	18.18254	144.71993	3626	153	
2016-12-07	04:19	Nice view of the milky flow.	18.18250	144.71998	3629	178	2016-12-07T04_18_59.958602_S5K.jpg
2016-12-07	04:19	Anemones here and not the other density of vent animals. A few lone shrimp.	18.18250	144.71992	3629	182	1481084354309S5K26217.jpg
2016-12-07	04:20	The wand is reading 8.3 in the holster as we settled down on the site. A lot of diffuse flow here.	18.18245	144.71989	3629	178	2016-12-07T04_20_21.935636_S5K.jpg
2016-12-07	04:20	Facing due south preparing to sample. pH is dropping as well on the wand.	18.18245	144.71990	3629	177	2016-12-07T04_20_53.933361_S5K.jpg
2016-12-07	04:21	Wand out of the holster and up in the water.	18.18245	144.71987	3629	177	
2016-12-07	04:21	Looking for any crack with flow.	18.18247	144.71989	3629	177	
2016-12-07	04:22	At 10.6 deg here.	18.18253	144.71998	3629	177	2016-12-07T04_22_20.949761_S5K.jpg
2016-12-07	04:22	Taking sensor readings.	18.18256	144.71995	3629	176	1481084574335S5K26437.jpg
2016-12-07	04:23	Little movement on the ROV and wand.	18.18256	144.71995	3629	174	2016-12-07T04_23_14.935405_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	04:24	Temp dropped from 12 to 6deg. Wand moved.	18.18256	144.71994	3629	174	2016-12-07T04_24_06.954017_S5K.jpg
2016-12-07	04:24	Repositioning into a crack.	18.18255	144.71994	3629	174	2016-12-07T04_24_23.942361_S5K.jpg
2016-12-07	04:24	Sensors pH=6.66 O2=3.01 Temp=12.5	18.18254	144.71994	3629	174	2016-12-07T04_24_58.941545_S5K.jpg
2016-12-07	04:26	S40-HFS-14 Start 04:26 Unfiltered Bag #20	18.18244	144.71995	3629	172	1481084807132S5K26670.jpg
2016-12-07	04:28	Observed good exhaust.	18.18251	144.71999	3629	172	1481084912345S5K26775.jpg
2016-12-07	04:28	Highlights on, fuzzy squat lobster by milky crack sampling.	18.18252	144.71999	3629	172	2016-12-07T04_28_55.953156_S5K.jpg
2016-12-07	04:29	Stop 04:39 Tmax=11.0 Tavg=10.2 vol=400 T2=6	18.18252	144.71998	3629	172	
2016-12-07	04:30	S40-HFS-15 Start 04:30. Filtered Bag #19. Same location in the milky flow as #20.	18.18252	144.71998	3629	172	2016-12-07T04_30_04.953892_S5K.jpg
2016-12-07	04:30	Highlights off.	18.18251	144.71997	3629	171	2016-12-07T04_30_44.960839_S5K.jpg
2016-12-07	04:31	HD new file started.	18.18251	144.71998	3629	171	2016-12-07T04_31_47.955566_S5K.jpg
2016-12-07	04:32	Not seeing much flow in the exhaust.	18.18253	144.71997	3629	171	
2016-12-07	04:32	Stop 04:32 Tmax=11.1 Tavg=9.8 vol=400 T2=5.5	18.18253	144.71997	3629	171	1481085177986S5K27041.jpg
2016-12-07	04:33	Stowing the wand.	18.18252	144.71996	3629	171	
2016-12-07	04:34	Going to head to waypoint #6 about 500m away.	18.18252	144.71996	3629	171	2016-12-07T04_34_56.939382_S5K.jpg
2016-12-07	04:35	Leighton is driving.	18.18250	144.71997	3629	171	1481085316981S5K27180.jpg
2016-12-07	04:36	Coming off the bottom and going to head north.	18.18252	144.71997	3629	163	1481085409416S5K27272.jpg
2016-12-07	04:37	Lots of smoke in the water from the milky flow.	18.18247	144.72000	3626	171	2016-12-07T04_37_21.968558_S5K.jpg
2016-12-07	04:37	Ship is going to try to keep up with us at .5kts.	18.18246	144.72000	3625	171	2016-12-07T04_37_37.946390_S5K.jpg
2016-12-07	04:38	Currently on a crest of a hill so will be driving down the hill.	18.18235	144.72000	3625	167	2016-12-07T04_38_03.972999_S5K.jpg
2016-12-07	04:38	Turning the vehicle around.	18.18234	144.71999	3623	289	1481085521459S5K27384.jpg
2016-12-07	04:39	Seeing a line of anemones.	18.18236	144.71999	3626	355	2016-12-07T04_39_12.973808_S5K.jpg
2016-12-07	04:39	Flatter lavas on the top of this hill.	18.18244	144.71999	3628	354	2016-12-07T04_39_38.967705_S5K.jpg
2016-12-07	04:40	Line of anemones at 339deg.	18.18251	144.71999	3628	340	2016-12-07T04_40_03.951351_S5K.jpg
2016-12-07	04:40	Passing the marker on the left side.	18.18254	144.71999	3628	340	2016-12-07T04_40_19.974174_S5K.jpg
2016-12-07	04:40	Marker was visible on the left of the image.	18.18258	144.72000	3629	340	2016-12-07T04_40_54.983098_S5K.jpg
2016-12-07	04:41	Passing over more murky flow down in the holes and cracks.	18.18262	144.72000	3628	339	2016-12-07T04_41_00.951583_S5K.jpg
2016-12-07	04:41	Seeing a more milky flow all over this anemone area.	18.18268	144.71999	3630	340	2016-12-07T04_41_41.958102_S5K.jpg
2016-12-07	04:42	Looks like some patches of more biology .	18.18273	144.71999	3630	326	2016-12-07T04_42_05.949163_S5K.jpg
2016-12-07	04:42	Lots of smoke and anemones and squat lobsters.	18.18285	144.72001	3633	328	2016-12-07T04_42_40.949038_S5K.jpg
2016-12-07	04:43	Still following some anemones.	18.18294	144.71993	3639	327	1481085807116S5K27670.jpg
2016-12-07	04:43	Out of the anemones and just seeing squat lobsters.	18.18294	144.71989	3639	327	2016-12-07T04_43_50.945948_S5K.jpg
2016-12-07	04:44	Lavas draping down the slope and squat lobsters.	18.18298	144.71984	3639	327	2016-12-07T04_44_24.951272_S5K.jpg
2016-12-07	04:45	Coming over a small ridge or cliff.	18.18303	144.71983	3643	341	2016-12-07T04_45_21.973368_S5K.jpg
2016-12-07	04:46	Going down.	18.18312	144.71975	3648	296	2016-12-07T04_46_49.964234_S5K.jpg
2016-12-07	04:47	Can see the slope behind us in the back camera (not recorded).	18.18331	144.71979	3654	329	
2016-12-07	04:48	Seeing bottom again at 3670m. Lots of lava and some sediment.	18.18341	144.71975	3672	301	2016-12-07T04_48_54.953945_S5K.jpg
2016-12-07	04:49	Big lava tubes and pillows. Striated pillow skins.	18.18345	144.71972	3676	324	2016-12-07T04_49_25.954858_S5K.jpg
2016-12-07	04:49	A few crabs but some non-vent filter feeders (corals).	18.18348	144.71970	3676	324	1481086191471S5K28054.jpg
2016-12-07	04:50	Squat lobsters and some yellow sediment (hydrothermal).	18.18354	144.71966	3672	324	2016-12-07T04_50_27.993763_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	04:51	Climbing along a pillow pile with a drop off to the east. Very steep slope.	18.18365	144.71960	3669	324	2016-12-07T04_51_25.988223_S5K.jpg
2016-12-07	04:52	Going downslope again.	18.18376	144.71954	3669	323	2016-12-07T04_52_32.979334_S5K.jpg
2016-12-07	04:53	Moving downslope and seeing just pillow and no anemones or squat lobsters. Ok-there is one squat lobster.	18.18380	144.71951	3671	321	1481086389174S5K28252.jpg
2016-12-07	04:54	Significant sediment on some of these pillow as we start going up hill now.	18.18393	144.71940	3678	323	2016-12-07T04_54_29.966284_S5K.jpg
2016-12-07	04:55	Moving over hills of pillow tubes and lavas.	18.18401	144.71932	3676	326	2016-12-07T04_55_15.980313_S5K.jpg
2016-12-07	04:55	Striated pillow skins and sediment. Long tubes.	18.18405	144.71929	3675	326	1481086533233S5K28396.jpg
2016-12-07	04:56	Top of this hill with some filter feeder.	18.18412	144.71925	3671	325	2016-12-07T04_56_10.966282_S5K.jpg
2016-12-07	04:56	Also an anemone at the top.	18.18415	144.71923	3669	327	1481086596165S5K28459.jpg
2016-12-07	04:57	Going downslope again.	18.18421	144.71920	3670	326	1481086623024S5K28486.jpg
2016-12-07	04:57	Another drop off as we were already going down hill.	18.18432	144.71917	3674	331	2016-12-07T04_57_47.994055_S5K.jpg
2016-12-07	04:59	Seeing the view of the hill from the back camera once again.	18.18445	144.71920	3687	332	
2016-12-07	04:59	Bit of rubble at the base of this hill.	18.18449	144.71922	3696	331	
2016-12-07	05:00	Talus flow.	18.18454	144.71920	3701	330	2016-12-07T05_00_15.976637_S5K.jpg
2016-12-07	05:01	Still going downhill, about 50m to go.	18.18466	144.71917	3706	289	2016-12-07T05_01_01.989410_S5K.jpg
2016-12-07	05:01	ROV took a look around to the left for a glimpse of the hill.	18.18469	144.71914	3702	216	2016-12-07T05_01_29.986608_S5K.jpg
2016-12-07	05:02	Looks like talus behind us on the hill	18.18474	144.71912	3714	330	
2016-12-07	05:03	Lots of sediment down at the bottom. Looks old.	18.18486	144.71909	3722	341	2016-12-07T05_03_30.973794_S5K.jpg
2016-12-07	05:04	Much heavier coating of sediment.	18.18494	144.71907	3722	331	2016-12-07T05_04_02.978738_S5K.jpg
2016-12-07	05:04	Should be traveling through a flat region.	18.18503	144.71902	3723	322	2016-12-07T05_04_35.980320_S5K.jpg
2016-12-07	05:05	Round pillow and a several fish.	18.18523	144.71888	3724	328	2016-12-07T05_05_20.989431_S5K.jpg
2016-12-07	05:05	Broader pillow lobes.	18.18530	144.71883	3724	328	2016-12-07T05_05_41.980818_S5K.jpg
2016-12-07	05:06	Coming up to a hill again.	18.18540	144.71878	3725	328	1481087177244S5K29040.jpg
2016-12-07	05:06	About 150m to go to the waypoint.	18.18547	144.71874	3724	328	1481087204384S5K29067.jpg
2016-12-07	05:07	There is still sediment but not as much (steeper or younger).	18.18553	144.71873	3724	338	2016-12-07T05_07_21.980255_S5K.jpg
2016-12-07	05:07	A few anemones around.	18.18558	144.71872	3723	338	1481087267330S5K29130.jpg
2016-12-07	05:08	Tubes and pillows.	18.18562	144.71872	3720	338	2016-12-07T05_08_19.006315_S5K.jpg
2016-12-07	05:08	Sparse biology.	18.18568	144.71871	3719	337	1481087319088S5K29182.jpg
2016-12-07	05:09	Waiting to winch in some tether.	18.18573	144.71871	3718	337	2016-12-07T05_09_31.008634_S5K.jpg
2016-12-07	05:10	Going to move off to the west to bring up the tether.	18.18569	144.71873	3717	312	
2016-12-07	05:11	More pillows and sediment and very few animals.	18.18563	144.71872	3718	292	1481087468090S5K29331.jpg
2016-12-07	05:12	Turning back to head north.	18.18558	144.71865	3719	313	2016-12-07T05_12_14.004484_S5K.jpg
2016-12-07	05:13	Heavy sediment. A few animals.	18.18564	144.71859	3715	313	1481087593110S5K29456.jpg
2016-12-07	05:13	Flatter looking pillow with sediment but we are a bit high off the bottom.	18.18577	144.71864	3714	341	2016-12-07T05_13_56.008258_S5K.jpg
2016-12-07	05:14	Going to go down a bit closer to the bottom.	18.18585	144.71859	3713	314	
2016-12-07	05:15	Very heavy sediment.	18.18589	144.71855	3715	320	1481087718182S5K29581.jpg
2016-12-07	05:16	Moving down to the bottom again.	18.18593	144.71815	3713	332	2016-12-07T05_16_35.997153_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	05:17	Flatter flow with a lot of sediment.	18.18601	144.71817	3718	329	2016-12-07T05_17_02.003858_S5K.jpg
2016-12-07	05:17	Ridge or collapse.	18.18610	144.71822	3714	332	1481087854161S5K29717.jpg
2016-12-07	05:18	There was a bit of a shadow in the Sentry bathy here.	18.18607	144.71818	3717	332	1481087912208S5K29775.jpg
2016-12-07	05:19	Fairly flat here with some stalked creatures.	18.18607	144.71811	3714	324	2016-12-07T05_19_42.990729_S5K.jpg
2016-12-07	05:20	Saw something hydrothermal looking.	18.18608	144.71805	3713	295	2016-12-07T05_20_19.993411_S5K.jpg
2016-12-07	05:20	Looks like some orange hydrothermal deposits. Old material of chimney remnants.	18.18611	144.71806	3717	321	
2016-12-07	05:22	Seeing some animals and a tall chimney (doesn't look very active).	18.18621	144.71802	3713	330	2016-12-07T05_22_25.022197_S5K.jpg
2016-12-07	05:23	Looking at some tall chimneys.	18.18622	144.71806	3714	351	2016-12-07T05_23_04.030340_S5K.jpg
2016-12-07	05:23	About 5m high or so.	18.18619	144.71798	3712	16	2016-12-07T05_23_25.021392_S5K.jpg
2016-12-07	05:23	Putting a navigational marker here.	18.18618	144.71800	3711	27	2016-12-07T05_23_53.011748_S5K.jpg
2016-12-07	05:24	Top of the old chimney.	18.18623	144.71798	3708	29	2016-12-07T05_24_28.013942_S5K.jpg
2016-12-07	05:24	There was some biology near the base. Probably anemones.	18.18622	144.71796	3713	32	2016-12-07T05_24_47.997761_S5K.jpg
2016-12-07	05:26	Seeing other chimneys in the sonar.	18.18626	144.71791	3716	34	2016-12-07T05_26_05.014547_S5K.jpg
2016-12-07	05:26	Base of chimney has some squat lobster and anemones.	18.18627	144.71791	3719	30	2016-12-07T05_26_30.005551_S5K.jpg
2016-12-07	05:26	Small shimmer. A lot of iron oxide deposits.	18.18627	144.71792	3719	6	2016-12-07T05_26_52.053476_S5K.jpg
2016-12-07	05:27	Tiny anemone-like animals making fuzzy rocks again.	18.18626	144.71794	3719	356	2016-12-07T05_27_24.037418_S5K.jpg
2016-12-07	05:28	Slowly panning around to see if there are other structures near by.	18.18626	144.71792	3718	340	
2016-12-07	05:28	Another chimney that is shorter to the north.	18.18633	144.71789	3715	355	2016-12-07T05_28_43.012274_S5K.jpg
2016-12-07	05:29	Biology to the left.	18.18646	144.71788	3711	358	2016-12-07T05_29_40.034023_S5K.jpg
2016-12-07	05:30	Just some more patches of anemones.	18.18648	144.71785	3713	358	2016-12-07T05_30_00.021983_S5K.jpg
2016-12-07	05:31	Looking at a downslope and chimneys behind us in the back camera.	18.18662	144.71794	3713	5	2016-12-07T05_31_01.016239_S5K.jpg
2016-12-07	05:31	HD new file started.	18.18661	144.71792	3715	5	1481088676497S5K30539.jpg
2016-12-07	05:31	More staining to the right.	18.18662	144.71791	3713	4	2016-12-07T05_31_32.013115_S5K.jpg
2016-12-07	05:32	Following a line of staining.	18.18655	144.71803	3710	29	2016-12-07T05_32_06.010130_S5K.jpg
2016-12-07	05:32	Slope is to the left of us.	18.18664	144.71807	3712	21	2016-12-07T05_32_32.036688_S5K.jpg
2016-12-07	05:33	Facing the east with the slope behind. Flat in front of the ROV.	18.18659	144.71808	3716	106	1481088803203S5K30666.jpg
2016-12-07	05:34	Turning left to head north again.	18.18656	144.71807	3715	99	2016-12-07T05_34_00.024395_S5K.jpg
2016-12-07	05:35	Not seeing any more evidence of hydrothermal deposits.	18.18678	144.71819	3721	35	2016-12-07T05_35_54.040287_S5K.jpg
2016-12-07	05:36	Turning to port looking back where we just came. Slope.	18.18669	144.71829	3719	310	2016-12-07T05_36_48.030842_S5K.jpg
2016-12-07	05:37	Seeing some staining again.	18.18668	144.71822	3720	254	1481089047158S5K30910.jpg
2016-12-07	05:38	Here come the old chimneys again.	18.18662	144.71810	3719	214	2016-12-07T05_38_16.019406_S5K.jpg
2016-12-07	05:39	Approaching the old chimney.	18.18674	144.71811	3718	224	2016-12-07T05_39_17.045536_S5K.jpg
2016-12-07	05:42	Some anemones at the base.	18.18660	144.71803	3711	258	1481089358328S5K31221.jpg
2016-12-07	05:45	Old chimneys in the distance.	18.18663	144.71796	3710	175	2016-12-07T05_45_52.027430_S5K.jpg
2016-12-07	05:47	Going to do a search pattern up to the north in a boxy pattern. Starting to the east.	18.18658	144.71790	3719	116	2016-12-07T05_47_07.046278_S5K.jpg
2016-12-07	05:48	There is a tiny pH anomaly here on the HFS sampler.	18.18655	144.71804	3718	95	2016-12-07T05_47_59.022715_S5K.jpg
2016-12-07	05:48	About 30m east so far.	18.18658	144.71817	3716	90	2016-12-07T05_48_58.014387_S5K.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	05:49	Can only go east as far as the zone of safety with the ship.	18.18662	144.71828	3716	96	2016-12-07T05_49_49.030251_S5K.jpg
2016-12-07	05:50	Turned west and see the old chimneys again.	18.18659	144.71828	3712	257	1481089823464S5K31686.jpg
2016-12-07	05:50	Now turning north (had to a big turn to the right for the tether/ship).	18.18656	144.71823	3714	335	
2016-12-07	05:51	Lots of sediment.	18.18663	144.71822	3718	358	1481089908030S5K31771.jpg
2016-12-07	05:52	Went about 20m to the north and now will head west.	18.18676	144.71816	3720	340	1481089942069S5K31805.jpg
2016-12-07	05:53	Older pillows with sediment.	18.18669	144.71811	3720	272	1481089982326S5K31845.jpg
2016-12-07	05:53	Coming up to an animal patch. More orange staining.	18.18664	144.71798	3718	273	2016-12-07T05_53_27.009279_S5K.jpg
2016-12-07	05:54	Anemones and some staining.	18.18660	144.71794	3718	273	2016-12-07T05_54_00.026141_S5K.jpg
2016-12-07	05:54	Still going west.	18.18659	144.71790	3717	272	2016-12-07T05_54_17.036063_S5K.jpg
2016-12-07	05:54	Dandelions and anemones.	18.18658	144.71786	3715	272	2016-12-07T05_54_42.024014_S5K.jpg
2016-12-07	05:55	Pockets of sediment between the pillows.	18.18655	144.71785	3714	273	2016-12-07T05_55_09.021063_S5K.jpg
2016-12-07	05:55	Ending the west line and turning to the north.	18.18653	144.71782	3711	273	2016-12-07T05_55_40.024211_S5K.jpg
2016-12-07	05:56	Sulfide.	18.18653	144.71776	3706	289	2016-12-07T05_56_19.038832_S5K.jpg
2016-12-07	05:56	Just some basalt.	18.18653	144.71777	3705	293	2016-12-07T05_56_30.031084_S5K.jpg
2016-12-07	05:56	Now completing the turn to the north.	18.18652	144.71783	3706	327	2016-12-07T05_56_46.015624_S5K.jpg
2016-12-07	05:57	Looking down a slope while heading north.	18.18659	144.71789	3702	352	1481090245361S5K32108.jpg
2016-12-07	05:57	Pillows dusted with sediment.	18.18662	144.71788	3705	351	2016-12-07T05_57_41.039014_S5K.jpg
2016-12-07	05:58	Coming up to a slope.	18.18671	144.71787	3703	351	1481090287340S5K32150.jpg
2016-12-07	05:58	Now turning to the east again.	18.18678	144.71798	3698	14	2016-12-07T05_58_46.024263_S5K.jpg
2016-12-07	05:59	Maybe came 20m to the north.	18.18677	144.71797	3696	75	
2016-12-07	05:59	Heading to the east but off the bottom. Going down the hill.	18.18676	144.71796	3697	92	
2016-12-07	05:59	More angular basalts.	18.18682	144.71802	3704	93	1481090397304S5K32260.jpg
2016-12-07	06:00	Hydrothermal staining and could be driving through the floc that has been dusted up.	18.18681	144.71809	3706	93	2016-12-07T06_00_16.020927_S5K.jpg
2016-12-07	06:01	A bit of staining.	18.18676	144.71824	3718	93	1481090484106S5K32347.jpg
2016-12-07	06:01	Turning back to the north again.	18.18674	144.71826	3720	52	1481090500310S5K32363.jpg
2016-12-07	06:02	Still going north along a hill coming down from the west.	18.18684	144.71823	3720	336	1481090565230S5K32428.jpg
2016-12-07	06:03	Turning to the west and going up the slope.	18.18696	144.71829	3720	12	2016-12-07T06_03_19.036734_S5K.jpg
2016-12-07	06:04	Heading west almost along a ridge. Starting to go downslope to port.	18.18701	144.71818	3710	272	2016-12-07T06_04_32.043688_S5K.jpg
2016-12-07	06:05	Cloudy here.	18.18693	144.71811	3705	281	2016-12-07T06_05_10.023761_S5K.jpg
2016-12-07	06:06	Lots of floc.	18.18688	144.71809	3704	269	1481090760073S5K32623.jpg
2016-12-07	06:06	Probably our own floc. Seeing a pH signal so maybe not.	18.18688	144.71809	3707	256	2016-12-07T06_06_14.036263_S5K.jpg
2016-12-07	06:06	Some hydrothermal staining but no animals.	18.18682	144.71806	3708	298	2016-12-07T06_06_40.031168_S5K.jpg
2016-12-07	06:07	Lots of sediment.	18.18676	144.71802	3710	303	2016-12-07T06_07_12.032239_S5K.jpg
2016-12-07	06:07	More angular rocks.	18.18667	144.71801	3710	312	1481090860354S5K32723.jpg
2016-12-07	06:08	Heading up the slope to the NW.	18.18664	144.71797	3712	301	2016-12-07T06_08_04.019266_S5K.jpg
2016-12-07	06:10	Going to move south of the old chimneys and search around there.	18.18687	144.71785	3699	285	
2016-12-07	06:10	Going to do a search pattern south of the old chimneys. Flying high.	18.18671	144.71787	3699	182	2016-12-07T06_10_44.044613_S5K.jpg
2016-12-07	06:11	Back at the old chimneys and there are the anemones.	18.18661	144.71792	3713	175	1481091089482S5K32952.jpg

Date	Time	S40 - Burke Field - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	06:13	Heading south.	18.18649	144.71804	3713	177	
2016-12-07	06:13	Lots of sediment.	18.18650	144.71803	3716	179	2016-12-07T06_13_42.023260_S5K.jpg
2016-12-07	06:13	Seeing a little sulfide. Saw that at the beginning.	18.18647	144.71798	3716	167	2016-12-07T06_13_57.043329_S5K.jpg
2016-12-07	06:14	Turning east now.	18.18641	144.71800	3711	95	2016-12-07T06_14_20.029095_S5K.jpg
2016-12-07	06:14	Sediment on pillows and no targets on the sonar.	18.18638	144.71813	3714	97	1481091288355S5K33151.jpg
2016-12-07	06:15	Hit the safety zone and turning south.	18.18636	144.71831	3713	110	1481091315250S5K33178.jpg
2016-12-07	06:16	Moving south.	18.18622	144.71843	3714	177	2016-12-07T06_16_20.052062_S5K.jpg
2016-12-07	06:16	Now turning to the west.	18.18618	144.71844	3713	206	2016-12-07T06_16_30.027743_S5K.jpg
2016-12-07	06:17	Dusty lavas with a few anemones.	18.18605	144.71841	3716	253	2016-12-07T06_17_16.037199_S5K.jpg
2016-12-07	06:17	Not seeing anything on the sonar.	18.18602	144.71828	3717	255	2016-12-07T06_17_58.048195_S5K.jpg
2016-12-07	06:18	Up on a flatter pillow ridge with sediment. Some stalked filter feeders and anemones.	18.18600	144.71816	3718	266	2016-12-07T06_18_34.049539_S5K.jpg
2016-12-07	06:19	Dusty pillows.	18.18595	144.71797	3717	270	2016-12-07T06_19_44.054284_S5K.jpg
2016-12-07	06:20	Still heading west.	18.18593	144.71791	3713	270	2016-12-07T06_20_07.048438_S5K.jpg
2016-12-07	06:21	Going to head north.	18.18599	144.71780	3703	284	1481091692421S5K33555.jpg
2016-12-07	06:22	Steep slope from the west.	18.18625	144.71776	3701	320	2016-12-07T06_22_49.038404_S5K.jpg
2016-12-07	06:24	Scanning the south.	18.18628	144.71785	3713	175	2016-12-07T06_24_32.039531_S5K.jpg
2016-12-07	06:24	Going down the hill as heading south.	18.18621	144.71783	3716	167	2016-12-07T06_24_57.035774_S5K.jpg
2016-12-07	06:25	Down on the flats again.	18.18611	144.71782	3716	133	2016-12-07T06_25_28.028293_S5K.jpg
2016-12-07	06:26	Heading east and not seeing anything on the sonar.	18.18605	144.71798	3717	87	2016-12-07T06_26_13.044194_S5K.jpg
2016-12-07	06:26	Flatter flows and sediment with a lot of dandelion feeders.	18.18605	144.71811	3717	69	1481092018500S5K33881.jpg
2016-12-07	06:28	Flat flows and no smoking-hot-chimneys.	18.18621	144.71837	3715	74	2016-12-07T06_28_13.027005_S5K.jpg
2016-12-07	06:28	Going to end this dive and get to working on the samples.	18.18622	144.71837	3715	152	2016-12-07T06_28_35.051086_S5K.jpg
2016-12-07	06:28	Coming up off the bottom.	18.18622	144.71831	3714	253	1481092137084S5K34000.jpg
2016-12-07	06:29	One last view of the old chimneys.	18.18629	144.71819	3713	302	
2016-12-07	06:29	Old chimney.	18.18631	144.71815	3711	305	1481092188307S5K34051.jpg
2016-12-07	06:30	That's all for today.....	18.18629	144.71814	3705	307	2016-12-07T06_30_46.045221_S5K.jpg
2016-12-07	06:31	Off bottom.	18.18631	144.71815	3696	307	

Table 6.6-7 Dive S41 – Hafa Adai

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	21:19	Setting up the HFS for taking sensor readings on the descent.	16.96141	144.86657	378	123	
2016-12-07	22:46	Altimeter is engaged.	16.96176	144.86667	3199	184	
2016-12-07	22:51	HD recording on. 30 m off bottom.	16.96187	144.86655	3266	181	S5K08156.jpg
2016-12-07	22:52	Bottom is in sight.	16.96188	144.86653	3276	181	S5K08215.jpg
2016-12-07	22:52	Seeing ropy sheet flows on the bottom.	16.96188	144.86653	3280	182	2016-12-07T22_52_32.428456_S5K.jpg
2016-12-07	22:53	According to nav we are 60m north of the waypoint and the sonar is looking only 40m ahead. Do not see a chimney at present.	16.96188	144.86654	3281	163	S5K08296.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	22:54	Turning to stbd looking around at the area.	16.96187	144.86656	3281	261	2016-12-07T22_54_05.422498_S5K.jpg
2016-12-07	22:54	Looking north.	16.96185	144.86658	3281	349	S5K08383.jpg
2016-12-07	22:55	Looking NE.	16.96184	144.86658	3281	24	S5K08399.jpg
2016-12-07	22:55	Looking east.	16.96183	144.86658	3281	65	2016-12-07T22_55_32.442340_S5K.jpg
2016-12-07	22:55	Checking white balance.	16.96183	144.86658	3281	41	2016-12-07T22_55_45.425962_S5K.jpg
2016-12-07	22:56	Turning the ROV back around counterclockwise before heading south.	16.96182	144.86659	3281	351	2016-12-07T22_56_00.431387_S5K.jpg
2016-12-07	22:57	See bits of yellow deposits on the seafloor. There were no sonar targets while twirling.	16.96180	144.86662	3281	218	2016-12-07T22_57_08.444179_S5K.jpg
2016-12-07	22:57	Putting SVP into the ROV navigation system.	16.96179	144.86662	3281	178	S5K08559.jpg
2016-12-07	22:58	Ropy flow with some staining a few filter-feeding animals.	16.96173	144.86662	3281	181	2016-12-07T22_58_25.453390_S5K.jpg
2016-12-07	22:58	Heading south to the waypoint.	16.96171	144.86662	3282	180	2016-12-07T22_58_44.435841_S5K.jpg
2016-12-07	22:59	A single squat lobster.	16.96158	144.86665	3281	181	2016-12-07T22_59_53.443373_S5K.jpg
2016-12-07	23:00	Seeing more lobsters.	16.96156	144.86665	3281	181	S5K08707.jpg
2016-12-07	23:00	Seeing more animals and white deposits.	16.96153	144.86665	3280	180	2016-12-07T23_00_28.440833_S5K.jpg
2016-12-07	23:01	Turning right and seeing sonar targets.	16.96150	144.86665	3281	205	2016-12-07T23_00_59.456210_S5K.jpg
2016-12-07	23:01	Sulfide log on the seafloor.	16.96149	144.86665	3281	205	S5K08773.jpg
2016-12-07	23:01	Sulfide mound with some animals at base.	16.96147	144.86664	3281	205	2016-12-07T23_01_41.462518_S5K.jpg
2016-12-07	23:02	Moving up the sulfide.	16.96147	144.86664	3280	206	2016-12-07T23_02_01.446510_S5K.jpg
2016-12-07	23:02	Looks like some active band as moving up.	16.96146	144.86663	3278	205	2016-12-07T23_02_32.444064_S5K.jpg
2016-12-07	23:03	Active chimney.	16.96141	144.86661	3273	204	S5K08897.jpg
2016-12-07	23:03	Smoking at the flange.	16.96140	144.86660	3273	204	S5K08910.jpg
2016-12-07	23:03	Seeing smoke in various locations.	16.96140	144.86660	3274	205	2016-12-07T23_03_50.465650_S5K.jpg
2016-12-07	23:04	Going to go up and down to view the entire structure.	16.96139	144.86659	3274	205	2016-12-07T23_04_08.446160_S5K.jpg
2016-12-07	23:04	Shrimp.	16.96139	144.86659	3273	205	2016-12-07T23_04_21.461296_S5K.jpg
2016-12-07	23:04	Highlights on.	16.96139	144.86659	3272	204	2016-12-07T23_04_40.446441_S5K.jpg
2016-12-07	23:04	Gorgeous view of the smoke and a flange.	16.96139	144.86659	3272	205	2016-12-07T23_04_55.456862_S5K.jpg
2016-12-07	23:05	WOW.	16.96139	144.86659	3271	205	S5K09008.jpg
2016-12-07	23:05	Shrimp and crabs with a lot of white material.	16.96138	144.86659	3269	204	2016-12-07T23_05_53.446093_S5K.jpg
2016-12-07	23:06	So far came up at least 15 meters but not at the top.	16.96138	144.86659	3268	203	S5K09068.jpg
2016-12-07	23:06	The top with an altitude of 16.5m.	16.96137	144.86658	3267	204	2016-12-07T23_06_56.442204_S5K.jpg
2016-12-07	23:07	Definitely a new chimney than seen on <i>Okeanos</i> . Shorter and narrower.	16.96137	144.86658	3267	203	S5K09125.jpg
2016-12-07	23:07	Doesn't appear as vigorous but very beautiful.	16.96138	144.86659	3266	221	2016-12-07T23_07_46.449144_S5K.jpg
2016-12-07	23:08	Turning as go back down the side.	16.96137	144.86661	3266	228	2016-12-07T23_08_03.438621_S5K.jpg
2016-12-07	23:08	This is looking west at the top of the chimney.	16.96135	144.86662	3267	248	S5K09203.jpg
2016-12-07	23:08	Two chimneys joined at the base looking west.	16.96134	144.86662	3266	256	2016-12-07T23_08_49.436789_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	23:09	Lots of smoke from the left chimney.	16.96131	144.86662	3266	265	S5K09255.jpg
2016-12-07	23:09	Crab and shrimp to the top of this &barbican; structure with shrimp on the top turret!	16.96131	144.86661	3266	264	2016-12-07T23_09_50.436823_S5K.jpg
2016-12-07	23:10	Many shrimp at the top of the chimney.	16.96131	144.86659	3266	266	2016-12-07T23_10_41.469508_S5K.jpg
2016-12-07	23:11	Still looking west.	16.96131	144.86659	3267	265	S5K09365.jpg
2016-12-07	23:11	This is the first view of this particular chimney ever. We are the first!	16.96131	144.86659	3266	265	S5K09380.jpg
2016-12-07	23:13	No other targets in the sonar looking to the west.	16.96132	144.86662	3265	265	2016-12-07T23_13_11.436648_S5K.jpg
2016-12-07	23:15	Shrimp and crabs.	16.96133	144.86660	3266	265	S5K09619.jpg
2016-12-07	23:16	Cluster of shrimp.	16.96133	144.86660	3266	265	2016-12-07T23_16_01.457677_S5K.jpg
2016-12-07	23:17	Moving down a bit.	16.96133	144.86660	3266	265	2016-12-07T23_17_05.449905_S5K.jpg
2016-12-07	23:17	Color on camera seems off as everything looks blue.	16.96132	144.86659	3268	265	S5K09745.jpg
2016-12-07	23:18	Plan is to do a video survey from top to bottom with a white balance camera check beforehand.	16.96132	144.86659	3267	264	2016-12-07T23_18_31.475384_S5K.jpg
2016-12-07	23:19	White balance again.	16.96132	144.86660	3266	262	2016-12-07T23_19_32.431079_S5K.jpg
2016-12-07	23:19	Downward shot.	16.96132	144.86660	3265	264	S5K09883.jpg
2016-12-07	23:19	Starting video survey.	16.96132	144.86661	3265	265	2016-12-07T23_19_58.447128_S5K.jpg
2016-12-07	23:20	Coming up to top of smoke.	16.96132	144.86660	3264	264	S5K09908.jpg
2016-12-07	23:21	Navigation indicates we are 15m further west than the bathymetry and maybe 5m south.	16.96132	144.86661	3265	265	2016-12-07T23_21_29.434955_S5K.jpg
2016-12-07	23:23	Flanges.	16.96132	144.86661	3271	264	2016-12-07T23_23_15.448470_S5K.jpg
2016-12-07	23:23	snails and anemones down near the bottom.	16.96132	144.86660	3271	265	2016-12-07T23_23_27.462934_S5K.jpg
2016-12-07	23:24	Snails on top of the flange and some below.	16.96132	144.86659	3273	265	S5K10157.jpg
2016-12-07	23:25	Shrimp at the crack and a lot of snails on the side of the chimney.	16.96132	144.86659	3274	264	2016-12-07T23_25_18.470911_S5K.jpg
2016-12-07	23:26	Shrimp on the edge of the flange on the upside down shoreline.	16.96132	144.86661	3274	263	2016-12-07T23_26_27.480329_S5K.jpg
2016-12-07	23:27	Piece fell off.	16.96133	144.86662	3275	263	S5K10338.jpg
2016-12-07	23:29	Moving up again.	16.96133	144.86660	3274	263	S5K10448.jpg
2016-12-07	23:34	Going to come around to the other side of the chimney.	16.96131	144.86659	3268	237	2016-12-07T23_34_31.445057_S5K.jpg
2016-12-07	23:35	View from the north looking south.	16.96133	144.86655	3268	198	2016-12-07T23_35_11.457409_S5K.jpg
2016-12-07	23:35	South.	16.96133	144.86654	3268	186	
2016-12-07	23:35	North chimney less active.	16.96134	144.86652	3268	162	2016-12-07T23_35_46.463594_S5K.jpg
2016-12-07	23:36	Still turning.	16.96133	144.86648	3268	135	2016-12-07T23_36_19.455400_S5K.jpg
2016-12-07	23:37	A lot of smoke from this side. Looking east.	16.96132	144.86651	3268	106	S5K10928.jpg
2016-12-07	23:37	Going to go down and see where the smoke is coming from.	16.96130	144.86650	3268	105	1481153848926S5K10944.jpg
2016-12-07	23:38	This side is smokier.	16.96128	144.86648	3270	106	2016-12-07T23_38_23.452518_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-07	23:39	Spinning slowly around the chimney.	16.96131	144.86649	3270	138	
2016-12-07	23:40	Looking south.	16.96135	144.86651	3270	165	2016-12-07T23_40_06.460596_S5K.jpg
2016-12-07	23:40	Turning to look west. This is the north side.	16.96135	144.86652	3270	167	2016-12-07T23_40_19.471852_S5K.jpg
2016-12-07	23:40	Coming around clockwise.	16.96134	144.86654	3270	192	2016-12-07T23_40_52.467995_S5K.jpg
2016-12-07	23:41	Turning clockwise.	16.96134	144.86656	3271	224	S5K11193.jpg
2016-12-07	23:42	Planning to sample the sulfide on the flange.	16.96132	144.86657	3270	251	2016-12-07T23_42_39.474716_S5K.jpg
2016-12-07	23:43	Almost looking due west.	16.96134	144.86660	3268	247	2016-12-07T23_43_37.461849_S5K.jpg
2016-12-07	23:44	Some clear fluid venting as well.	16.96133	144.86657	3270	249	2016-12-07T23_44_58.487691_S5K.jpg
2016-12-07	23:45	That is the target.	16.96133	144.86657	3271	249	2016-12-07T23_45_11.460914_S5K.jpg
2016-12-07	23:45	Pieces of chimney on top of the flange.	16.96133	144.86657	3271	249	2016-12-07T23_45_26.491554_S5K.jpg
2016-12-07	23:46	Can see the broken pieces and where the piece broke off.	16.96133	144.86658	3270	249	2016-12-07T23_46_11.454809_S5K.jpg
2016-12-07	23:46	Preparing to sample.	16.96132	144.86658	3271	248	S5K11505.jpg
2016-12-07	23:47	Heading is 248 and depth is 3270 with altitude 13m on this chimney.	16.96132	144.86658	3270	249	S5K11522.jpg
2016-12-07	23:48	Approaching the flange to sample the broken sulfide pieces.	16.96132	144.86659	3271	248	2016-12-07T23_48_59.454976_S5K.jpg
2016-12-07	23:51	Shrimp all around the piece.	16.96133	144.86658	3272	247	1481154692540S5K11788.jpg
2016-12-07	23:53	Got it.	16.96133	144.86657	3272	247	2016-12-07T23_53_06.474208_S5K.jpg
2016-12-07	23:53	S41-Geo-01. Piece of chimney that had fallen on top of the flange on the east side of the Two Towers Chimney. About 13m up the chimney.	16.96133	144.86657	3271	248	S5K11893.jpg
2016-12-07	23:54	Place in the forward biobox in the aft-port quadrant.	16.96138	144.86658	3269	247	2016-12-07T23_54_30.484456_S5K.jpg
2016-12-07	23:55	Did not break when placed in box.	16.96138	144.86661	3269	248	2016-12-07T23_55_17.463438_S5K.jpg
2016-12-07	23:55	Great sampling by Jason, Cody and Adam!	16.96135	144.86659	3268	247	2016-12-07T23_55_41.451528_S5K.jpg
2016-12-07	23:56	Next will attempt to get a temperature reading of the black smoke where just sampled.	16.96135	144.86657	3269	247	
2016-12-07	23:57	Highlights off while we get ready for next sampling.	16.96135	144.86656	3269	247	2016-12-07T23_57_07.469992_S5K.jpg
2016-12-07	23:57	The piece looks like it came off the active smoking chimney on top of the flange.	16.96136	144.86659	3268	247	2016-12-07T23_57_54.456729_S5K.jpg
2016-12-07	23:58	HD new file started.	16.96136	144.86659	3268	247	2016-12-07T23_58_26.488572_S5K.jpg
2016-12-07	23:58	Retrieving the ROV temperature wand.	16.96137	144.86659	3269	246	
2016-12-07	23:59	Approaching the chimney for the temperature reading.	16.96136	144.86659	3269	247	2016-12-07T23_59_28.479603_S5K.jpg
2016-12-08	00:01	Highlights on again.	16.96134	144.86657	3274	247	2016-12-08T00_01_46.490644_S5K.jpg
2016-12-08	00:01	Great view with the ROV lights overhead.	16.96134	144.86657	3274	247	S5K12401.jpg
2016-12-08	00:04	Coming in at a different angle to use the porch for stability and reach the flange for a reading.	16.96138	144.86655	3271	187	2016-12-08T00_04_27.479761_S5K.jpg
2016-12-08	00:05	This is looking south at the north wall of the chimney with the flange on the left.	16.96140	144.86653	3271	178	2016-12-08T00_05_52.465811_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	00:06	Highlights off for a minute.	16.96135	144.86654	3272	176	2016-12-08T00_06_31.477061_S5K.jpg
2016-12-08	00:07	Moving back around to view the east side of the chimney.	16.96136	144.86655	3271	190	2016-12-08T00_07_18.485430_S5K.jpg
2016-12-08	00:07	Coming down to the flange.	16.96134	144.86656	3271	225	2016-12-08T00_07_51.491782_S5K.jpg
2016-12-08	00:08	Trying to measure the flange to the right of the flange where the sample was taken.	16.96134	144.86655	3273	225	2016-12-08T00_08_46.482447_S5K.jpg
2016-12-08	00:09	Measuring whichever it can reach to.	16.96134	144.86655	3273	224	2016-12-08T00_09_16.473131_S5K.jpg
2016-12-08	00:11	Closer...	16.96133	144.86656	3273	225	2016-12-08T00_10_59.483505_S5K.jpg
2016-12-08	00:11	Background 1.46°C.	16.96133	144.86657	3273	225	
2016-12-08	00:12	Approaching from below.	16.96136	144.86658	3274	225	
2016-12-08	00:13	Adjusting the winch on the tether so the ROV will not be pulled.	16.96137	144.86657	3275	225	2016-12-08T00_13_36.495874_S5K.jpg
2016-12-08	00:14	Some pooling under the flange.	16.96136	144.86657	3274	225	2016-12-08T00_14_48.470847_S5K.jpg
2016-12-08	00:16	Coming in....	16.96135	144.86656	3274	225	2016-12-08T00_16_40.492851_S5K.jpg
2016-12-08	00:17	High temp was 236°C and going up before pulled off.	16.96135	144.86657	3274	224	S5K13367.jpg
2016-12-08	00:18	Going to move in again.	16.96135	144.86656	3275	224	2016-12-08T00_18_31.503109_S5K.jpg
2016-12-08	00:20	Bungee is stretched to the max.	16.96136	144.86656	3276	224	
2016-12-08	00:20	Probe tip is pointed up further than before.	16.96136	144.86657	3274	226	1481156420961S5K13516.jpg
2016-12-08	00:20	Sonar shows the probe is 1.2 meters in front of the ROV.	16.96137	144.86657	3274	232	S5K13551.jpg
2016-12-08	00:21	Getting closer.	16.96135	144.86657	3274	232	2016-12-08T00_21_36.483453_S5K.jpg
2016-12-08	00:21	Sonar is showing probe closing in on the chimney.	16.96134	144.86657	3274	232	2016-12-08T00_21_46.494065_S5K.jpg
2016-12-08	00:23	Moving ever closer.	16.96132	144.86658	3274	233	S5K13685.jpg
2016-12-08	00:23	Probe in the hot area.	16.96132	144.86658	3274	233	2016-12-08T00_23_36.504895_S5K.jpg
2016-12-08	00:24	Just a little poke and went only to 146deg.	16.96132	144.86657	3274	232	2016-12-08T00_23_54.494043_S5K.jpg
2016-12-08	00:24	Only 102deg.	16.96134	144.86657	3274	232	2016-12-08T00_24_21.482699_S5K.jpg
2016-12-08	00:24	Didn't stay in for long.	16.96134	144.86656	3274	232	S5K13790.jpg
2016-12-08	00:25	High temp was 280deg.	16.96136	144.86656	3274	232	S5K13845.jpg
2016-12-08	00:26	Lost visibility.	16.96136	144.86656	3274	232	2016-12-08T00_26_18.497153_S5K.jpg
2016-12-08	00:27	Going to try to measure a regular chimney instead with a normal down angle on the probe.	16.96137	144.86658	3274	231	2016-12-08T00_27_39.474634_S5K.jpg
2016-12-08	00:28	Decided to give the flange one more try.	16.96137	144.86658	3273	235	2016-12-08T00_28_41.500313_S5K.jpg
2016-12-08	00:32	Lots of snails on the side of the chimney out of the hot flow.	16.96134	144.86653	3272	164	2016-12-08T00_32_56.490974_S5K.jpg
2016-12-08	00:34	Bump on the chimney.	16.96133	144.86654	3272	164	S5K14358.jpg
2016-12-08	00:34	Reaching around with the probe from the side.	16.96133	144.86654	3272	166	2016-12-08T00_34_36.494160_S5K.jpg
2016-12-08	00:37	Not in all the way with only 60deg.	16.96135	144.86654	3272	168	2016-12-08T00_37_45.522896_S5K.jpg
2016-12-08	00:38	No visibility.	16.96135	144.86654	3272	169	S5K14601.jpg
2016-12-08	00:39	Can't quite get in there for a good sample.	16.96135	144.86654	3272	167	S5K14664.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	00:39	Rise up and look for future sampling.	16.96137	144.86653	3270	167	2016-12-08T00_39_57.514706_S5K.jpg
2016-12-08	00:40	Big smoker at top of the chimney.	16.96137	144.86654	3268	169	2016-12-08T00_40_17.494370_S5K.jpg
2016-12-08	00:41	The north side is inactive compared to the south tower.	16.96136	144.86654	3267	168	2016-12-08T00_41_11.483864_S5K.jpg
2016-12-08	00:41	There is some activity here but not as much as the chimneys behind.	16.96136	144.86653	3267	167	2016-12-08T00_41_37.510902_S5K.jpg
2016-12-08	00:42	Going to come around to the other side for a complete look.	16.96135	144.86652	3267	146	2016-12-08T00_42_28.494508_S5K.jpg
2016-12-08	00:43	Moving around clockwise.	16.96135	144.86652	3266	138	S5K14878.jpg
2016-12-08	00:43	Looking south again.	16.96135	144.86653	3267	167	2016-12-08T00_43_24.485115_S5K.jpg
2016-12-08	00:43	Coming around to the east side looking from the west.	16.96136	144.86655	3267	205	2016-12-08T00_43_55.516303_S5K.jpg
2016-12-08	00:44	East side of the chimney top.	16.96134	144.86656	3267	234	S5K14949.jpg
2016-12-08	00:44	Very active smoker here.	16.96132	144.86657	3267	268	2016-12-08T00_44_35.495334_S5K.jpg
2016-12-08	00:45	Facing the big smoker head-on at 288.	16.96131	144.86656	3267	287	2016-12-08T00_45_08.493116_S5K.jpg
2016-12-08	00:45	Still holding the temperature probe so could fly in for a reading.	16.96131	144.86656	3267	288	2016-12-08T00_45_40.489963_S5K.jpg
2016-12-08	00:46	Highlights on. Trying to take temp from top black smokers.	16.96131	144.86656	3267	302	2016-12-08T00_46_01.552662_S5K.jpg
2016-12-08	00:46	Heading 300 with a good view of some black smokers.	16.96131	144.86656	3267	301	2016-12-08T00_46_07.515206_S5K.jpg
2016-12-08	00:47	Approaching the smoker.	16.96131	144.86656	3267	301	2016-12-08T00_47_08.516016_S5K.jpg
2016-12-08	00:47	Ship is pulling the ROV.	16.96131	144.86656	3267	300	S5K15141.jpg
2016-12-08	00:49	Fragile piece.	16.96131	144.86655	3267	302	2016-12-08T00_49_48.509387_S5K.jpg
2016-12-08	00:50	Smoke has cleared from the break.	16.96131	144.86655	3267	302	S5K15310.jpg
2016-12-08	00:50	Temp above here is over 4°C	16.96131	144.86655	3267	301	
2016-12-08	00:54	One more try.	16.96130	144.86654	3266	302	S5K15538.jpg
2016-12-08	00:59	Highlights off.	16.96130	144.86655	3267	311	2016-12-08T00_59_04.522652_S5K.jpg
2016-12-08	00:59	One more attempt.	16.96130	144.86655	3267	311	2016-12-08T00_59_29.519266_S5K.jpg
2016-12-08	00:59	HD new file started.	16.96130	144.86655	3267	311	2016-12-08T00_59_32.517955_S5K.jpg
2016-12-08	01:01	Probe went in the small chimney and broke it but the temperature only made it up to the 30s.	16.96130	144.86654	3268	314	2016-12-08T01_01_40.517837_S5K.jpg
2016-12-08	01:02	Going to move on to waypoint #2 the next chimney to the east.	16.96134	144.86658	3265	282	
2016-12-08	01:03	Switching pilots.	16.96139	144.86655	3267	240	2016-12-08T01_03_46.499954_S5K.jpg
2016-12-08	01:05	Talus pile at the bottom.	16.96135	144.86661	3279	194	S5K16233.jpg
2016-12-08	01:06	Moved south away from Two Towers and can see its base in the rear camera.	16.96129	144.86666	3282	165	
2016-12-08	01:07	Sheet flows on the bottom.	16.96125	144.86675	3283	122	2016-12-08T01_07_30.491349_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	01:07	Heading east and can see the next chimney in the sonar as advertised.	16.96124	144.86678	3283	116	S5K16362.jpg
2016-12-08	01:08	Line of animals on the seafloor leading to the chimney.	16.96122	144.86683	3283	110	2016-12-08T01_08_09.499071_S5K.jpg
2016-12-08	01:08	Pieces of sulfide on the seafloor.	16.96122	144.86685	3281	114	2016-12-08T01_08_30.512894_S5K.jpg
2016-12-08	01:08	Highlights on coming up to the next chimney.	16.96122	144.86685	3281	116	2016-12-08T01_08_31.519085_S5K.jpg
2016-12-08	01:08	Can see the base of the chimney with white active areas.	16.96121	144.86687	3280	118	2016-12-08T01_08_43.496595_S5K.jpg
2016-12-08	01:09	Base of chimney.	16.96121	144.86689	3277	133	2016-12-08T01_09_11.527063_S5K.jpg
2016-12-08	01:09	Large side structure.	16.96119	144.86692	3275	132	S5K16469.jpg
2016-12-08	01:10	Several black smokers and older chimneys.	16.96118	144.86694	3274	133	2016-12-08T01_09_59.520213_S5K.jpg
2016-12-08	01:10	Looking at the west side.	16.96118	144.86693	3273	129	2016-12-08T01_10_34.519599_S5K.jpg
2016-12-08	01:10	Squat lobsters on the base.	16.96117	144.86693	3274	127	2016-12-08T01_10_47.538465_S5K.jpg
2016-12-08	01:10	Highlights off while position.	16.96117	144.86693	3274	127	2016-12-08T01_10_48.538601_S5K.jpg
2016-12-08	01:12	Highlights on. Looking around.	16.96116	144.86693	3275	127	2016-12-08T01_12_12.514925_S5K.jpg
2016-12-08	01:12	Looking for a stable place to sample.	16.96116	144.86694	3274	127	2016-12-08T01_12_24.531575_S5K.jpg
2016-12-08	01:12	ROV about 2.5m away from chimney.	16.96114	144.86696	3274	123	S5K16669.jpg
2016-12-08	01:14	Getting stable next to chimney.	16.96114	144.86693	3275	126	S5K16737.jpg
2016-12-08	01:14	Getting the ROV steady on the chimney.	16.96114	144.86692	3274	125	2016-12-08T01_14_22.515167_S5K.jpg
2016-12-08	01:14	Will start with temperature probe.	16.96113	144.86692	3274	125	2016-12-08T01_14_46.538062_S5K.jpg
2016-12-08	01:17	197.....here....130...	16.96113	144.86696	3274	125	2016-12-08T01_17_23.528824_S5K.jpg
2016-12-08	01:17	Chimney is crumbling.	16.96114	144.86695	3274	125	2016-12-08T01_17_44.516339_S5K.jpg
2016-12-08	01:18	66deg out of the hole.	16.96116	144.86696	3274	123	S5K17027.jpg
2016-12-08	01:21	Only up to the 80s.	16.96115	144.86698	3274	124	2016-12-08T01_21_06.518173_S5K.jpg
2016-12-08	01:21	257deg was the high but still not getting stable reading.	16.96115	144.86698	3274	124	2016-12-08T01_21_58.537781_S5K.jpg
2016-12-08	01:22	297deg on that attempt.	16.96115	144.86699	3274	124	2016-12-08T01_22_48.522616_S5K.jpg
2016-12-08	01:23	Broken off most of the chimney and getting to a nice orifice.	16.96114	144.86696	3274	124	2016-12-08T01_23_29.529363_S5K.jpg
2016-12-08	01:25	Going up slow...248...270...That was the high.	16.96115	144.86698	3274	124	2016-12-08T01_25_09.528086_S5K.jpg
2016-12-08	01:26	Highlights off for now.	16.96117	144.86698	3274	124	2016-12-08T01_26_45.519599_S5K.jpg
2016-12-08	01:26	Tape is melting of the probe.	16.96116	144.86698	3274	124	S5K17503.jpg
2016-12-08	01:28	217°C was the high that time.	16.96119	144.86697	3274	123	2016-12-08T01_28_35.525175_S5K.jpg
2016-12-08	01:29	232deg.	16.96119	144.86696	3274	123	2016-12-08T01_29_26.510121_S5K.jpg
2016-12-08	01:29	283deg.	16.96119	144.86696	3274	123	2016-12-08T01_29_40.519224_S5K.jpg
2016-12-08	01:31	296deg that time.	16.96118	144.86693	3274	123	2016-12-08T01_31_35.542928_S5K.jpg
2016-12-08	01:35	Straight down. Calcopyrite on the broken edges. 302.05 was the high and temperature fairly stable at 301deg.	16.96113	144.86689	3274	123	S5K18020.jpg
2016-12-08	01:37	Want to take a gas tight at the same angle.	16.96114	144.86692	3274	123	S5K18119.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	01:41	Preparing to take a gas tight sample in the same location.	16.96116	144.86700	3274	122	S5K18394.jpg
2016-12-08	01:42	Unstrapping the bungees holding the gas tight sampler.	16.96115	144.86700	3274	122	2016-12-08T01_42_09.518589_S5K.jpg
2016-12-08	01:45	Bungee off.	16.96114	144.86700	3274	122	2016-12-08T01_45_14.507039_S5K.jpg
2016-12-08	01:47	Reaching for the red-green gas tight bottle.	16.96114	144.86695	3274	121	S5K18717.jpg
2016-12-08	01:52	Got it.	16.96115	144.86697	3274	119	2016-12-08T01_52_11.526392_S5K.jpg
2016-12-08	01:52	Good.	16.96115	144.86696	3274	119	2016-12-08T01_52_29.510809_S5K.jpg
2016-12-08	01:53	Rotating the sampler around to align the ram.	16.96114	144.86694	3274	119	2016-12-08T01_53_54.528741_S5K.jpg
2016-12-08	01:56	Arm is rotating gastight bottle in grip.	16.96116	144.86693	3274	119	S5K19348.jpg
2016-12-08	01:58	Trying to move ROV back a little to give the arm more room.	16.96115	144.86695	3274	118	2016-12-08T01_58_54.524994_S5K.jpg
2016-12-08	01:59	HD new file started.	16.96115	144.86695	3274	118	2016-12-08T01_59_04.539465_S5K.jpg
2016-12-08	02:00	ROV has moved off chimney. Trying to reposition.	16.96115	144.86694	3273	102	2016-12-08T02_00_32.524725_S5K.jpg
2016-12-08	02:03	ROV is steady against the chimney. Going to try again.	16.96113	144.86695	3274	96	2016-12-08T02_03_31.572848_S5K.jpg
2016-12-08	02:07	The ram on the arm only hits about half of the plunger on the gastight bottle (red/green). The two are slightly misaligned.	16.96113	144.86696	3274	96	2016-12-08T02_07_14.536818_S5K.jpg
2016-12-08	02:08	The angle of the intake is bad also (is angled up instead of down).	16.96113	144.86696	3274	96	2016-12-08T02_08_02.556886_S5K.jpg
2016-12-08	02:08	ROV was pulled off the chimney.	16.96113	144.86697	3274	94	2016-12-08T02_08_53.536171_S5K.jpg
2016-12-08	02:11	Discussing strategy about how to get the orientation of the gastight better. Maybe bend the intake tip?	16.96114	144.86697	3274	92	S5K20161.jpg
2016-12-08	02:12	Going to try to bend the intake against the starboard arm.	16.96114	144.86697	3274	92	2016-12-08T02_12_20.543435_S5K.jpg
2016-12-08	02:15	Intake is straightened out.	16.96113	144.86697	3274	88	S5K20446.jpg
2016-12-08	02:16	Orange shrimp on white chimney in foreground.	16.96111	144.86696	3274	88	S5K20500.jpg
2016-12-08	02:16	Trying to get the angle of the bottle as vertical as possible.	16.96111	144.86696	3274	88	2016-12-08T02_16_53.559702_S5K.jpg
2016-12-08	02:17	Little black chimney building in the background.	16.96110	144.86696	3274	88	2016-12-08T02_17_04.574530_S5K.jpg
2016-12-08	02:19	Fired...good one. Saw the firing as it sucked the water in.	16.96109	144.86691	3274	83	2016-12-08T02_19_58.526742_S5K.jpg
2016-12-08	02:20	S41-GTB-02 Red-green taken from the same orifice the 302deg fluid was measured with the ROV wand. From the west side of the chimney near the base but where the active venting began.	16.96108	144.86690	3274	84	S5K20722.jpg
2016-12-08	02:23	Storing the gas tight sampler back into the basket.	16.96115	144.86695	3274	84	

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	02:24	Sample taken from the west side of the 30m chimney near the base at 3274m depth.	16.96113	144.86695	3274	84	
2016-12-08	02:24	The sampling location is a place where the ROV could park under the beginning of the hot active realm of the chimney. The chimney bulges out from the base diameter where the venting began.	16.96113	144.86695	3274	84	2016-12-08T02_24_46.550579_S5K.jpg
2016-12-08	02:27	Gas tight is stowed and bungee has it secured.	16.96111	144.86696	3274	84	
2016-12-08	02:27	Next on the list is to do some suction sampling at this same location.	16.96111	144.86696	3274	84	2016-12-08T02_27_50.545084_S5K.jpg
2016-12-08	02:31	Highlights on while suction sampling.	16.96113	144.86694	3274	81	2016-12-08T02_31_02.580395_S5K.jpg
2016-12-08	02:31	Suction hose is in the manipulator ready to go.	16.96114	144.86694	3274	81	2016-12-08T02_31_12.554183_S5K.jpg
2016-12-08	02:31	Want these darker snails. Can put it into jar 7.	16.96114	144.86695	3274	81	S5K21386.jpg
2016-12-08	02:32	Might be baby snails or are they limpets.	16.96116	144.86695	3274	81	S5K21452.jpg
2016-12-08	02:33	Starting to sample.	16.96115	144.86696	3274	81	S5K21491.jpg
2016-12-08	02:34	S41-Bio-03 Suction of snails located to the right of the gas tight sample. Going to jar #7 with a 2mm mesh.	16.96116	144.86695	3274	81	2016-12-08T02_34_28.587850_S5K.jpg
2016-12-08	02:36	Need about 30 snails. Only one in the jar.	16.96115	144.86696	3274	81	
2016-12-08	02:36	Hairy snails. Getting a better grip on the suction hose.	16.96114	144.86696	3274	81	2016-12-08T02_36_29.559494_S5K.jpg
2016-12-08	02:37	Looks like the HFS wand was causing a problem.	16.96112	144.86696	3274	81	
2016-12-08	02:38	Seeing snails being suctioned. Now coming into the jar.	16.96107	144.86696	3274	80	2016-12-08T02_38_34.564433_S5K.jpg
2016-12-08	02:40	ROV has come away from the chimney.	16.96113	144.86696	3274	82	2016-12-08T02_40_29.571708_S5K.jpg
2016-12-08	02:41	Slight reposition and coming back for more snails.	16.96114	144.86696	3274	91	S5K21988.jpg
2016-12-08	02:42	Sucking and can see the scar where they used to be.	16.96114	144.86696	3275	91	S5K22039.jpg
2016-12-08	02:43	Sample looks good.	16.96114	144.86697	3274	91	S5K22080.jpg
2016-12-08	02:43	Indexing to flush jar #8 to close the sample.	16.96114	144.86697	3274	91	2016-12-08T02_43_19.578347_S5K.jpg
2016-12-08	02:43	Looking for a smaller species of shrimp.	16.96114	144.86697	3274	91	2016-12-08T02_43_32.552791_S5K.jpg
2016-12-08	02:44	A few extra snails came into jar 8.	16.96114	144.86696	3274	89	
2016-12-08	02:44	Indexing to put shrimp sample in jar #5 (500m).	16.96114	144.86697	3274	89	2016-12-08T02_44_45.579026_S5K.jpg
2016-12-08	02:45	Looking to sample the brightly colored and smaller shrimp.	16.96114	144.86697	3274	89	2016-12-08T02_45_16.574213_S5K.jpg
2016-12-08	02:46	Looking for a reachable shrimp.	16.96114	144.86697	3274	89	2016-12-08T02_46_58.565087_S5K.jpg
2016-12-08	02:47	Trying to angle the suction to get at the shrimp.	16.96114	144.86697	3274	89	S5K22347.jpg
2016-12-08	02:49	Going to move the ROV a bit to get a better angle.	16.96114	144.86697	3275	88	
2016-12-08	02:50	Highlights off while position.	16.96114	144.86697	3275	88	S5K22500.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	02:50	Still looking at the west side of the chimney but getting the angle of the suction nose into the chimney wall.	16.96116	144.86696	3275	121	
2016-12-08	02:54	One just underneath the hose.	16.96114	144.86696	3274	110	
2016-12-08	02:55	S41-Bio-04 Suction of small-red shrimp into jar #5. Still on the west side of the chimney where the gas tight was taken.	16.96115	144.86696	3274	110	S5K22839.jpg
2016-12-08	02:57	Getting ready for another suction into jar #3.	16.96115	144.86696	3274	110	
2016-12-08	02:57	Jar #3 is a 500micron mesh and jar #4 is 1mm mesh.	16.96115	144.86696	3274	111	
2016-12-08	03:00	There are some palm worms here but too hard to get a sample at this location.	16.96115	144.86696	3274	111	2016-12-08T03_00_03.586249_S5K.jpg
2016-12-08	03:01	S41-Bio-05 Suction of 'crud' and some small shrimp into jar #3. Same location as the previous biology suction.	16.96115	144.86696	3274	111	2016-12-08T03_01_24.593236_S5K.jpg
2016-12-08	03:01	Highlights on while suction rock surface.	16.96115	144.86696	3274	111	S5K23205.jpg
2016-12-08	03:02	Scraping rock with suction hose.	16.96115	144.86696	3274	112	2016-12-08T03_02_33.597285_S5K.jpg
2016-12-08	03:03	Continue to suction on the white surfaces.	16.96115	144.86696	3274	111	S5K23295.jpg
2016-12-08	03:03	Sulfide worms are in the back of the sampler here.	16.96115	144.86696	3274	112	2016-12-08T03_03_36.598593_S5K.jpg
2016-12-08	03:04	Polychaete worms, sulfide worms may have gotten into the suction.	16.96115	144.86696	3274	111	2016-12-08T03_04_01.592514_S5K.jpg
2016-12-08	03:04	Worms under the shrimp.	16.96115	144.86696	3274	111	2016-12-08T03_04_58.579008_S5K.jpg
2016-12-08	03:05	Paralvinella hessleri correctly spelled.	16.96115	144.86696	3274	111	2016-12-08T03_05_53.601153_S5K.jpg
2016-12-08	03:06	Can see the many scrapes of white material suctioned from here.	16.96115	144.86697	3274	110	2016-12-08T03_06_42.586203_S5K.jpg
2016-12-08	03:07	Images of scraped patches.	16.96115	144.86696	3274	110	S5K23529.jpg
2016-12-08	03:09	One more scrape before closing this sample.	16.96115	144.86697	3274	111	
2016-12-08	03:10	Rotating the jar to #8.	16.96116	144.86696	3274	110	
2016-12-08	03:11	Highlights off.	16.96116	144.86695	3273	109	2016-12-08T03_11_32.586882_S5K.jpg
2016-12-08	03:11	Stowing the suction sampler.	16.96116	144.86695	3274	111	
2016-12-08	03:12	HD new file started.	16.96114	144.86694	3273	111	S5K23821.jpg
2016-12-08	03:12	Looks like the Taj Majal.	16.96115	144.86695	3272	103	2016-12-08T03_12_37.595245_S5K.jpg
2016-12-08	03:12	Going to go back down to the same location.	16.96116	144.86695	3273	113	
2016-12-08	03:13	Highlights on, looking around again.	16.96115	144.86695	3274	125	2016-12-08T03_13_39.601253_S5K.jpg
2016-12-08	03:13	Positioning back on to the chimney to get some HFS samplers.	16.96115	144.86695	3275	126	S5K23932.jpg
2016-12-08	03:14	Retrieving the HFS wand from the basket.	16.96115	144.86694	3274	125	
2016-12-08	03:15	Highlights off	16.96115	144.86694	3274	128	2016-12-08T03_15_05.577722_S5K.jpg
2016-12-08	03:17	Moving to get a good angle for the HFS wand.	16.96116	144.86698	3274	139	2016-12-08T03_17_06.609821_S5K.jpg
2016-12-08	03:18	Reaching over to get to the black smokers.	16.96117	144.86697	3274	134	S5K24226.jpg

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2016-12-08	03:25	Very close but only in the 40s.	16.96113	144.86697	3275	135	2016-12-08T03_25_56.584549_S5K.jpg
2016-12-08	03:26	Perfect location.	16.96114	144.86697	3274	135	2016-12-08T03_26_55.591385_S5K.jpg
2016-12-08	03:27	Slipped out.	16.96114	144.86697	3275	135	2016-12-08T03_27_09.599094_S5K.jpg
2016-12-08	03:28	S41-HFS-06 Start 03:28 Unfiltered piston #8. With good flow. Tip is in the minerals.	16.96114	144.86697	3274	136	2016-12-08T03_28_37.604368_S5K.jpg
2016-12-08	03:30	Tip came out briefly but looks back in again.	16.96113	144.86697	3274	136	2016-12-08T03_30_10.584041_S5K.jpg
2016-12-08	03:31	Pump is now down to 150 ml/min at just over half full. Slipped off again.	16.96114	144.86697	3274	136	2016-12-08T03_31_39.601718_S5K.jpg
2016-12-08	03:32	Back on.	16.96114	144.86698	3274	136	
2016-12-08	03:32	Stop Tmax=132.5 Tavg=110 vol=600 T2 32.	16.96114	144.86698	3274	136	S5K25057.jpg
2016-12-08	03:34	Highlights on, looking around.	16.96114	144.86698	3274	136	2016-12-08T03_34_41.604574_S5K.jpg
2016-12-08	03:34	S41-HFS-07 Start 03:34 Filtered Piston #3 at the same exact location as the unfiltered piston. Good exhaust.	16.96114	144.86698	3274	136	2016-12-08T03_34_43.611372_S5K.jpg
2016-12-08	03:35	Under flange.	16.96114	144.86698	3274	136	2016-12-08T03_35_35.611356_S5K.jpg
2016-12-08	03:36	Nice views of flange and shrimp on the edge.	16.96115	144.86698	3274	136	2016-12-08T03_36_01.604420_S5K.jpg
2016-12-08	03:39	Stop. Tmax=85.5 Tavg=76 vol=500 T2=27.	16.96119	144.86697	3274	136	
2016-12-08	03:40	Going to try to sample the spigot just above that the last few framegrabs were taken of.	16.96117	144.86698	3274	136	S5K25513.jpg
2016-12-08	03:41	Can't reach that without damaging the hose.	16.96117	144.86697	3274	136	
2016-12-08	03:41	Stow the wand and then see if there is a small chimney to sample.	16.96117	144.86697	3274	136	2016-12-08T03_41_23.586438_S5K.jpg
2016-12-08	03:42	Wand is stowed.	16.96117	144.86697	3274	136	2016-12-08T03_42_35.593248_S5K.jpg
2016-12-08	03:42	Want to sample this round-bulbous structure with the smoke coming out.	16.96118	144.86697	3274	137	S5K25665.jpg
2016-12-08	03:43	Going to try using the scoop to get it.	16.96117	144.86697	3274	137	2016-12-08T03_43_12.611761_S5K.jpg
2016-12-08	03:43	Now decided the one to the right of the round one would be better.	16.96117	144.86697	3274	137	S5K25708.jpg
2016-12-08	03:44	Reaching with the manipulator.	16.96117	144.86697	3274	138	2016-12-08T03_44_25.618843_S5K.jpg
2016-12-08	03:49	Almost had that piece but crushed in the jaws.	16.96115	144.86696	3274	129	S5K26046.jpg
2016-12-08	03:49	S41-Geo-08 Piece of smoking chimney just above where the last fluid samples were taken on the west side of the 30m chimney. Fragments of the chimney.	16.96116	144.86695	3275	122	S5K26093.jpg
2016-12-08	03:51	Sample was put into forward-stbd quadrant of the small bio box.	16.96114	144.86697	3274	113	
2016-12-08	03:52	Retrieving the metal scoop to try to get another sulfide sample.	16.96114	144.86695	3273	114	2016-12-08T03_52_42.595075_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	03:54	Snagged a marker when retrieving the scoop. Might need to deploy the marker to keep it out of the view.	16.96117	144.86693	3274	112	2016-12-08T03_53_55.604049_S5K.jpg
2016-12-08	03:55	DEPLOY Mkr-254 at this site.	16.96116	144.86693	3275	113	
2016-12-08	03:56	Dropped the marker down to the base of the chimney which is 13m below. Did not get a view of the marker since we are deploying it to continue sampling up here. We are on the west side of the chimney at 140deg and it was dropped from the port arm. It could be more north of the west side.	16.96120	144.86691	3273	136	
2016-12-08	03:57	Have the metal scoop with an unobstructed view. Mkr-254 is at the 30m chimney which is still unnamed otherwise.	16.96121	144.86692	3274	141	S5K26539.jpg
2016-12-08	03:58	Coming back to the chimney to get a sample. Looking at the north side now.	16.96122	144.86697	3273	155	2016-12-08T03_58_07.613266_S5K.jpg
2016-12-08	03:58	North side.	16.96120	144.86695	3273	159	1481169538663S5K26634.jpg
2016-12-08	03:59	Now swinging around and looking at the west side.	16.96117	144.86693	3274	124	2016-12-08T03_59_20.588978_S5K.jpg
2016-12-08	03:59	Going for that round-gray rock with the metal scoop.	16.96116	144.86696	3274	117	S5K26686.jpg
2016-12-08	04:01	The geo sample wasn't really venting before we sampled it. Can see the scar now of where it broke off.	16.96114	144.86696	3274	113	S5K26768.jpg
2016-12-08	04:04	Very hard. Scoop broke off.	16.96112	144.86695	3274	109	2016-12-08T04_04_24.611740_S5K.jpg
2016-12-08	04:06	Finally came out of the jaws and fell on to the basket.	16.96113	144.86696	3274	109	S5K27055.jpg
2016-12-08	04:06	Using the manipulator to get this one since apparently it is much harder in composition.	16.96111	144.86697	3274	110	2016-12-08T04_06_48.633218_S5K.jpg
2016-12-08	04:07	S41-Geo-09 Got a piece of the second rock (which broke the scoop) Forward-stbd portion of the biobox with the last geo sample.	16.96111	144.86697	3274	110	S5K27140.jpg
2016-12-08	04:09	Next some visual surveys of this chimney.	16.96113	144.86695	3274	109	S5K27276.jpg
2016-12-08	04:10	Want to go slowly up/down and around.	16.96114	144.86694	3273	111	S5K27309.jpg
2016-12-08	04:10	Lots of small-skinny chimlets.	16.96115	144.86694	3273	124	S5K27323.jpg
2016-12-08	04:10	Highlights on, survey chimney at WP 2.	16.96115	144.86694	3273	123	2016-12-08T04_10_28.644353_S5K.jpg
2016-12-08	04:11	Coming up to the top and getting situated for visual survey.	16.96115	144.86694	3272	123	S5K27358.jpg
2016-12-08	04:11	Still looking east at the top of the west side of this massive chimney.	16.96116	144.86694	3271	123	2016-12-08T04_11_55.629265_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	04:13	Going up close to the chimney and then back down a bit further from the chimney.	16.96116	144.86696	3273	126	2016-12-08T04_13_03.645318_S5K.jpg
2016-12-08	04:13	Fallen chimney.	16.96117	144.86697	3272	127	2016-12-08T04_13_29.634331_S5K.jpg
2016-12-08	04:13	Tan chimneys appear less active.	16.96117	144.86698	3272	126	2016-12-08T04_13_52.616399_S5K.jpg
2016-12-08	04:14	White more active and crazy shapes.	16.96118	144.86699	3272	126	2016-12-08T04_14_35.625513_S5K.jpg
2016-12-08	04:15	Lateral to the right.	16.96115	144.86697	3271	123	
2016-12-08	04:15	About 2m away from chimney.	16.96114	144.86697	3270	125	2016-12-08T04_15_40.630617_S5K.jpg
2016-12-08	04:18	Dead zone in middle and now more active toward the top.	16.96115	144.86698	3264	123	S5K27818.jpg
2016-12-08	04:19	Altitude is 24m.	16.96114	144.86698	3262	123	2016-12-08T04_19_21.649014_S5K.jpg
2016-12-08	04:20	g	16.96115	144.86698	3259	124	2016-12-08T04_20_16.639116_S5K.jpg
2016-12-08	04:20	At 28m.	16.96114	144.86697	3257	122	S5K27950.jpg
2016-12-08	04:21	Up at 31m.	16.96114	144.86698	3254	122	2016-12-08T04_21_40.646485_S5K.jpg
2016-12-08	04:21	Turning stbd and pulling away before going down to look at this 90deg differently.	16.96115	144.86699	3255	118	
2016-12-08	04:23	Rotating around to look at the east side of the chimney.	16.96114	144.86705	3254	231	2016-12-08T04_23_25.616550_S5K.jpg
2016-12-08	04:24	Less active side here.	16.96113	144.86704	3255	235	2016-12-08T04_24_01.622174_S5K.jpg
2016-12-08	04:26	Some activity and about 2m away.	16.96115	144.86704	3260	233	S5K28273.jpg
2016-12-08	04:27	22m	16.96115	144.86705	3264	244	S5K28365.jpg
2016-12-08	04:28	Snails, limpets and crabs.	16.96115	144.86704	3265	228	2016-12-08T04_28_36.650792_S5K.jpg
2016-12-08	04:29	Middle part with little venting.	16.96115	144.86704	3267	226	2016-12-08T04_29_54.638878_S5K.jpg
2016-12-08	04:34	Shrimp fest.	16.96115	144.86704	3275	231	2016-12-08T04_34_01.667941_S5K.jpg
2016-12-08	04:37	Marker! Could barely see it at the base to the right so it fell more on the north side.	16.96120	144.86709	3279	232	S5K28957.jpg
2016-12-08	04:38	Off away from the base about 8m away looking SW.	16.96120	144.86713	3279	245	S5K29008.jpg
2016-12-08	04:38	Doing highlights of the whole structure.	16.96118	144.86711	3277	242	2016-12-08T04_38_58.644297_S5K.jpg
2016-12-08	04:39	About 5m away.	16.96116	144.86707	3273	237	2016-12-08T04_39_38.651041_S5K.jpg
2016-12-08	04:42	Rotating slightly to the left as climb up.	16.96110	144.86704	3255	279	2016-12-08T04_42_43.632058_S5K.jpg
2016-12-08	04:43	Done with video survey and going to go along the waypoints to other chimneys.	16.96109	144.86704	3253	289	2016-12-08T04_43_10.620418_S5K.jpg
2016-12-08	04:43	Highlights off	16.96110	144.86705	3255	284	2016-12-08T04_43_36.653201_S5K.jpg
2016-12-08	04:44	Turning to the east.	16.96116	144.86709	3258	350	
2016-12-08	04:45	The 30m chimney is now called Sequoia and it has many burls on it.	16.96120	144.86710	3260	10	2016-12-08T04_45_10.646067_S5K.jpg
2016-12-08	04:46	Heading to waypoint #3. There were chimlets at this site when <i>Okeanos</i> visited here earlier this year on Dive #11.	16.96130	144.86720	3282	58	
2016-12-08	04:46	HD new file started.	16.96132	144.86724	3281	68	2016-12-08T04_46_52.648664_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	04:47	Here is the next chimney.	16.96134	144.86730	3279	79	2016-12-08T04_47_25.646122_S5K.jpg
2016-12-08	04:48	Highlight on, next waypoint with lots of small chimlets.	16.96134	144.86738	3283	78	2016-12-08T04_48_47.635492_S5K.jpg
2016-12-08	04:49	Many chimlets and about 3m tall. Active venting behind this tall one.	16.96134	144.86739	3283	85	S5K29636.jpg
2016-12-08	04:51	Looks like some diffuse flow to the left.	16.96135	144.86740	3283	96	2016-12-08T04_51_02.646197_S5K.jpg
2016-12-08	04:51	Coming around to the north looking SE.	16.96136	144.86740	3284	106	2016-12-08T04_51_27.676641_S5K.jpg
2016-12-08	04:52	Looking at the shimmer to the bottom right.	16.96136	144.86742	3285	101	2016-12-08T04_52_43.654660_S5K.jpg
2016-12-08	04:53	Looks like some good flow for diffuse sampling.	16.96135	144.86743	3285	102	2016-12-08T04_53_14.643515_S5K.jpg
2016-12-08	04:53	Looking east at the west side of Chimlet Garden courtesy of Heidi.	16.96135	144.86745	3285	100	
2016-12-08	04:54	Highlights off.	16.96135	144.86745	3285	100	2016-12-08T04_54_02.660566_S5K.jpg
2016-12-08	04:54	Preparing the sampler.	16.96136	144.86746	3285	100	2016-12-08T04_54_45.663660_S5K.jpg
2016-12-08	04:57	Want to sample the fluids in the crack.	16.96137	144.86739	3285	97	2016-12-08T04_57_35.666183_S5K.jpg
2016-12-08	04:58	Temperature here is 20 and climbing. Pushing probe in further to the crack.	16.96137	144.86738	3285	97	2016-12-08T04_58_14.652906_S5K.jpg
2016-12-08	04:59	Looking for about 50deg water. Too cold here.	16.96139	144.86735	3285	95	2016-12-08T04_59_29.653560_S5K.jpg
2016-12-08	05:01	Crab attacking the wand.	16.96143	144.86732	3285	95	2016-12-08T05_01_52.659579_S5K.jpg
2016-12-08	05:03	Taking sensor readings.	16.96142	144.86739	3285	92	2016-12-08T05_03_42.674525_S5K.jpg
2016-12-08	05:04	Still not hot enough.	16.96138	144.86742	3285	92	2016-12-08T05_04_45.675361_S5K.jpg
2016-12-08	05:05	15deg there.	16.96138	144.86742	3285	92	2016-12-08T05_05_17.673024_S5K.jpg
2016-12-08	05:06	10deg there.	16.96133	144.86745	3285	92	S5K30698.jpg
2016-12-08	05:07	13deg there.	16.96131	144.86739	3285	92	S5K30772.jpg
2016-12-08	05:13	Piece of chimney broke off.	16.96135	144.86739	3285	90	S5K31076.jpg
2016-12-08	05:15	Only 6deg.	16.96141	144.86743	3285	90	S5K31247.jpg
2016-12-08	05:18	Going to look around for a better place to sample diffuse flow. Holding on to the wand.	16.96139	144.86745	3285	90	
2016-12-08	05:21	Lots of squat lobsters. in white cracks on the seafloor. Looks like only a little flow.	16.96141	144.86742	3282	78	2016-12-08T05_21_44.665732_S5K.jpg
2016-12-08	05:22	Heading east. With some extinct chimneys.	16.96147	144.86748	3282	79	2016-12-08T05_22_17.672413_S5K.jpg
2016-12-08	05:22	Inactive chimneys.	16.96148	144.86752	3279	78	2016-12-08T05_22_36.651979_S5K.jpg
2016-12-08	05:23	Not much activity on that little chimlet.	16.96151	144.86757	3280	78	S5K31680.jpg
2016-12-08	05:24	Inactive chimneys.	16.96149	144.86767	3282	78	2016-12-08T05_24_05.641393_S5K.jpg
2016-12-08	05:24	Turning right to look a bit more south.	16.96146	144.86773	3281	126	2016-12-08T05_24_55.660379_S5K.jpg
2016-12-08	05:25	Sonar showing something ahead. Doesn't look active.	16.96141	144.86777	3281	160	S5K31816.jpg
2016-12-08	05:25	Another chimney beyond.	16.96137	144.86780	3280	153	2016-12-08T05_25_40.671265_S5K.jpg
2016-12-08	05:25	This one looks active.	16.96134	144.86782	3275	145	2016-12-08T05_25_57.649219_S5K.jpg
2016-12-08	05:26	See black smoke out of right arm.	16.96131	144.86785	3275	141	2016-12-08T05_26_29.653537_S5K.jpg
2016-12-08	05:27	Highlights on.	16.96131	144.86787	3276	139	2016-12-08T05_27_00.661695_S5K.jpg

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2016-12-08	05:27	Highlights on.	16.96130	144.86786	3276	124	2016-12-08T05_27_10.665738_S5K.jpg
2016-12-08	05:27	Old sulfide log covered in shrimp. Squat lobsters below.	16.96128	144.86786	3277	112	2016-12-08T05_27_41.679243_S5K.jpg
2016-12-08	05:28	Skinny little fingers. This is Alba Chimney!	16.96127	144.86787	3276	109	2016-12-08T05_28_30.690159_S5K.jpg
2016-12-08	05:29	Taking a look for some diffuse flow.	16.96128	144.86786	3277	113	2016-12-08T05_29_32.686892_S5K.jpg
2016-12-08	05:29	Highlights off.	16.96128	144.86786	3277	112	S5K32080.jpg
2016-12-08	05:29	Lots of shimmer behind the rock.	16.96128	144.86786	3277	112	2016-12-08T05_29_55.672948_S5K.jpg
2016-12-08	05:31	Going to try to fluid sample where the snails are.	16.96128	144.86786	3277	112	2016-12-08T05_31_18.686672_S5K.jpg
2016-12-08	05:32	Already have the wand in hand.	16.96129	144.86787	3277	115	S5K32259.jpg
2016-12-08	05:35	Moving in closer to get to the warm water.	16.96126	144.86786	3277	114	
2016-12-08	05:35	Trying to get in closer to where the snails are.	16.96125	144.86787	3277	109	S5K32438.jpg
2016-12-08	05:37	Aiming for where the lasers were pointing.	16.96124	144.86791	3277	109	2016-12-08T05_37_41.671810_S5K.jpg
2016-12-08	05:38	Looking to the west at the east side of Alba Vent.	16.96124	144.86793	3277	110	2016-12-08T05_38_56.685567_S5K.jpg
2016-12-08	05:43	Trying to get the angle of the hose and wand to reach the snails.	16.96127	144.86788	3277	104	
2016-12-08	05:46	Still trying to position the wand.	16.96125	144.86788	3277	103	2016-12-08T05_46_34.665521_S5K.jpg
2016-12-08	05:47	Temp here is only 6deg.	16.96126	144.86788	3277	103	2016-12-08T05_47_22.687520_S5K.jpg
2016-12-08	05:47	Warmer here.	16.96126	144.86788	3277	103	2016-12-08T05_47_45.672664_S5K.jpg
2016-12-08	05:48	Temp is going up here....17deg.	16.96125	144.86788	3277	103	2016-12-08T05_48_13.669940_S5K.jpg
2016-12-08	05:49	Moving to the left is cooler.	16.96126	144.86787	3277	104	2016-12-08T05_49_32.700667_S5K.jpg
2016-12-08	05:50	Getting black in the exhaust.	16.96125	144.86787	3277	103	2016-12-08T05_50_27.674656_S5K.jpg
2016-12-08	05:52	This is about 16-18deg	16.96124	144.86787	3277	103	2016-12-08T05_52_19.681466_S5K.jpg
2016-12-08	05:52	Tip came out of that spot.	16.96125	144.86787	3277	105	2016-12-08T05_52_57.690250_S5K.jpg
2016-12-08	05:53	That is about 20-25deg in there.	16.96124	144.86790	3277	104	2016-12-08T05_53_48.671300_S5K.jpg
2016-12-08	05:54	Flushing the sensor port.	16.96124	144.86789	3277	104	2016-12-08T05_54_20.674625_S5K.jpg
2016-12-08	05:55	Wand came out. Too much crud on the wand tip.	16.96125	144.86788	3277	106	2016-12-08T05_55_29.675668_S5K.jpg
2016-12-08	05:57	Looking for somewhere else around here so we don't have to move.	16.96125	144.86790	3277	101	2016-12-08T05_57_02.708368_S5K.jpg
2016-12-08	05:57	Want to sample where the tip can be seen.	16.96126	144.86790	3277	101	S5K33743.jpg
2016-12-08	05:59	This looks good here. Was 23deg but now dropped to 10.	16.96127	144.86789	3278	103	2016-12-08T05_59_28.691460_S5K.jpg
2016-12-08	06:00	Can see palm worms just above the line of shrimp.	16.96130	144.86789	3278	103	S5K33951.jpg
2016-12-08	06:01	Crab scattering the shrimp.	16.96129	144.86789	3278	103	2016-12-08T06_01_20.698811_S5K.jpg
2016-12-08	06:01	Gets to 22deg when not pumping and then drops with the pump on.	16.96129	144.86790	3278	103	2016-12-08T06_01_31.708730_S5K.jpg
2016-12-08	06:02	Wand pulled off.	16.96127	144.86790	3278	107	S5K34070.jpg
2016-12-08	06:03	Bumped the chimney side.	16.96128	144.86789	3278	110	2016-12-08T06_03_28.682885_S5K.jpg
2016-12-08	06:03	Slightly different position and not as hot.	16.96128	144.86789	3278	110	S5K34121.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	06:05	Done trying to get a sample here. Want to head to waypoint 5 &6. Going to hold the wand.	16.96127	144.86788	3278	110	2016-12-08T06_05_35.679370_S5K.jpg
2016-12-08	06:06	Pulling up and over this vent and will continue to the east.	16.96133	144.86789	3276	109	2016-12-08T06_06_43.671794_S5K.jpg
2016-12-08	06:07	Stowing the wand after all. Looks flat sheet flows underneath.	16.96137	144.86802	3281	103	S5K34370.jpg
2016-12-08	06:08	Bottom camera shows sheet flows.	16.96134	144.86804	3282	108	
2016-12-08	06:09	Tall skinny chimney that looks inactive.	16.96136	144.86808	3280	109	S5K34435.jpg
2016-12-08	06:09	Sheet flows with some squat lobsters.	16.96140	144.86821	3281	108	S5K34477.jpg
2016-12-08	06:10	Flat.	16.96142	144.86826	3282	108	2016-12-08T06_09_59.699974_S5K.jpg
2016-12-08	06:10	Something coming up on the left on sonar.	16.96143	144.86831	3281	108	2016-12-08T06_10_14.681377_S5K.jpg
2016-12-08	06:10	Sheet flow.	16.96147	144.86835	3282	79	2016-12-08T06_10_39.674969_S5K.jpg
2016-12-08	06:11	Sheet flow that resembled a log.	16.96152	144.86837	3284	78	S5K34552.jpg
2016-12-08	06:11	Driving by sonar.	16.96155	144.86845	3283	70	2016-12-08T06_11_33.692751_S5K.jpg
2016-12-08	06:12	Sheet flow is a bit more jumbled.	16.96161	144.86853	3282	61	2016-12-08T06_12_00.692170_S5K.jpg
2016-12-08	06:12	Heading to the cone as nothing came of the sonar target.	16.96168	144.86858	3282	61	2016-12-08T06_12_37.692688_S5K.jpg
2016-12-08	06:12	Sheet flow is more jumbled and not very flat.	16.96169	144.86865	3282	62	2016-12-08T06_12_55.678712_S5K.jpg
2016-12-08	06:13	A few random squat lobsters.	16.96171	144.86872	3282	61	2016-12-08T06_13_18.699495_S5K.jpg
2016-12-08	06:13	Lava!	16.96166	144.86877	3282	59	S5K34712.jpg
2016-12-08	06:13	Coming up to a slope. Squat lobsters and some sulfide looking material.	16.96163	144.86881	3281	61	2016-12-08T06_13_52.706699_S5K.jpg
2016-12-08	06:14	Seeing anemones on the rock tops.	16.96162	144.86890	3279	60	S5K34760.jpg
2016-12-08	06:14	Coming over the lip of the crater.	16.96157	144.86897	3276	29	2016-12-08T06_14_56.699483_S5K.jpg
2016-12-08	06:15	Highlights on, circling the cone at waypoint 6.	16.96156	144.86899	3275	16	2016-12-08T06_15_01.701618_S5K.jpg
2016-12-08	06:15	A lot of anemones.	16.96156	144.86903	3275	19	S5K34807.jpg
2016-12-08	06:15	Squat lobsters.	16.96155	144.86907	3276	19	2016-12-08T06_15_25.695276_S5K.jpg
2016-12-08	06:15	Some white staining in the distance.	16.96155	144.86910	3277	22	S5K34839.jpg
2016-12-08	06:16	Milky flow here.	16.96155	144.86916	3275	6	S5K34859.jpg
2016-12-08	06:16	Diffuse flow.	16.96156	144.86921	3276	344	2016-12-08T06_16_18.684657_S5K.jpg
2016-12-08	06:16	Squat lobsters surrounding the diffuse vent. Lots of shimmer and some orange staining.	16.96161	144.86920	3277	0	2016-12-08T06_16_41.712601_S5K.jpg
2016-12-08	06:18	Putting a navigational marker here at the diffuse venting along the rim.	16.96169	144.86917	3279	84	2016-12-08T06_18_02.711196_S5K.jpg
2016-12-08	06:18	Looking for a bed of snails in shimmering water.	16.96171	144.86916	3278	49	2016-12-08T06_18_26.720012_S5K.jpg
2016-12-08	06:18	Turning north looking across the crater.	16.96173	144.86912	3281	24	2016-12-08T06_18_51.704140_S5K.jpg
2016-12-08	06:19	Highlights off.	16.96174	144.86913	3283	358	2016-12-08T06_19_09.691157_S5K.jpg
2016-12-08	06:19	Can see the rim of the crater in the rear camera.	16.96173	144.86914	3282	356	2016-12-08T06_19_17.694336_S5K.jpg
2016-12-08	06:19	Seeing clusters of small animals.	16.96174	144.86912	3282	52	S5K35085.jpg
2016-12-08	06:20	Looks like dead snails.	16.96175	144.86912	3283	55	2016-12-08T06_20_05.719627_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	06:20	Looking west and seeing the milky flow again.	16.96173	144.86912	3282	65	2016-12-08T06_20_22.700223_S5K.jpg
2016-12-08	06:22	Looking south and seeing lots of orange sediment with squat lobsters.	16.96171	144.86910	3281	191	
2016-12-08	06:23	A lot of sediment and squat lobsters.	16.96170	144.86911	3282	164	2016-12-08T06_23_19.711082_S5K.jpg
2016-12-08	06:23	Moving up to look at the rim.	16.96170	144.86912	3282	157	2016-12-08T06_23_35.696974_S5K.jpg
2016-12-08	06:24	Lateralling to the left.	16.96168	144.86914	3279	137	2016-12-08T06_24_06.700577_S5K.jpg
2016-12-08	06:25	Chimlets on the rim.	16.96169	144.86918	3279	116	2016-12-08T06_25_15.692761_S5K.jpg
2016-12-08	06:25	Looking for snails.	16.96168	144.86919	3278	117	2016-12-08T06_25_27.713868_S5K.jpg
2016-12-08	06:25	Snails in the cracks.	16.96167	144.86920	3278	117	2016-12-08T06_25_57.724635_S5K.jpg
2016-12-08	06:26	Looking SE on the inside of the SE caldera rim.	16.96167	144.86920	3277	118	2016-12-08T06_26_30.716301_S5K.jpg
2016-12-08	06:27	Chimlets on the rim.	16.96165	144.86921	3277	118	2016-12-08T06_27_00.705190_S5K.jpg
2016-12-08	06:27	Continue to the left to look for the snail spot to deploy Amanda's experiment.	16.96164	144.86922	3276	118	S5K35537.jpg
2016-12-08	06:28	Coming back down into the crater along the caldera wall.	16.96167	144.86920	3276	104	S5K35577.jpg
2016-12-08	06:28	Snails in the wall in cracks.	16.96168	144.86919	3277	106	S5K35597.jpg
2016-12-08	06:28	Looking more due east at the crater inside wall.	16.96168	144.86918	3277	105	2016-12-08T06_28_36.698320_S5K.jpg
2016-12-08	06:29	Venting and shimmer as back away from the wall. Milky flow.	16.96170	144.86916	3277	106	S5K35638.jpg
2016-12-08	06:29	Lots of crabs.	16.96170	144.86921	3278	106	2016-12-08T06_29_37.736760_S5K.jpg
2016-12-08	06:30	Seeing a lot of venting along the rim edge.	16.96173	144.86922	3278	96	S5K35704.jpg
2016-12-08	06:30	Looking at the bright white patches.	16.96173	144.86926	3276	90	2016-12-08T06_30_54.708122_S5K.jpg
2016-12-08	06:31	Lots of snails on the white diffuse venting area.	16.96174	144.86929	3276	90	2016-12-08T06_31_23.704268_S5K.jpg
2016-12-08	06:31	Highlights on. Snailiferous area in cone.	16.96175	144.86929	3276	88	2016-12-08T06_31_50.729841_S5K.jpg
2016-12-08	06:32	Looking at the inside rim of the east side.	16.96175	144.86929	3276	87	2016-12-08T06_32_04.708684_S5K.jpg
2016-12-08	06:32	Venting on the east side.	16.96177	144.86928	3275	87	2016-12-08T06_32_45.708363_S5K.jpg
2016-12-08	06:33	Barnacles feeding.	16.96177	144.86928	3276	89	2016-12-08T06_33_16.713082_S5K.jpg
2016-12-08	06:33	Rocks look fuzzy with the barnacle cirri out feeding.	16.96177	144.86928	3275	88	2016-12-08T06_33_58.715788_S5K.jpg
2016-12-08	06:34	This might be a good place to deploy the hula hoop.	16.96177	144.86926	3276	91	2016-12-08T06_34_49.700814_S5K.jpg
2016-12-08	06:35	Going to keep going to the left to survey the entire inside of the crater.	16.96177	144.86924	3275	94	S5K36023.jpg
2016-12-08	06:36	Might be flatter here for deploying the hoop.	16.96182	144.86920	3277	130	S5K36089.jpg
2016-12-08	06:37	Highlights off.	16.96179	144.86918	3277	126	2016-12-08T06_37_17.715379_S5K.jpg
2016-12-08	06:37	This looks really good.	16.96178	144.86918	3277	124	2016-12-08T06_37_28.724756_S5K.jpg
2016-12-08	06:38	Many snails here.	16.96179	144.86917	3277	90	2016-12-08T06_38_00.727105_S5K.jpg
2016-12-08	06:38	Going to deploy a real marker here to come back later for snail experiment.	16.96179	144.86916	3277	89	S5K36212.jpg
2016-12-08	06:39	Retrieving a marker from the basket...winner is Mkr-171.	16.96178	144.86920	3277	93	2016-12-08T06_39_53.700596_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	06:40	DEPLOY Mkr-171 at the potential snail experiment site.	16.96178	144.86920	3277	92	2016-12-08T06_40_46.718313_S5K.jpg
2016-12-08	06:41	Deployment view.	16.96178	144.86920	3277	92	2016-12-08T06_41_36.707178_S5K.jpg
2016-12-08	06:41	Marker is near the east crater rim on the inside but further down from the rim in a flatter area with snails.	16.96177	144.86920	3277	92	2016-12-08T06_41_58.723882_S5K.jpg
2016-12-08	06:42	Pilots think we have viewed the entire inside of the crater. (Need to check if that is true).	16.96178	144.86920	3277	91	2016-12-08T06_42_52.710841_S5K.jpg
2016-12-08	06:43	Pulling off the bottom of the crater.	16.96177	144.86919	3277	92	2016-12-08T06_43_22.709332_S5K.jpg
2016-12-08	06:43	Cloudy venting.	16.96178	144.86919	3275	110	S5K36518.jpg
2016-12-08	06:43	View of the marker.	16.96179	144.86919	3275	119	S5K36533.jpg
2016-12-08	06:44	Up and over the rim.	16.96177	144.86925	3272	125	S5K36563.jpg
2016-12-08	06:45	Heading out east. Cone was about 50m wide at the base.	16.96177	144.86930	3270	124	2016-12-08T06_45_02.695245_S5K.jpg
2016-12-08	06:45	Squat lobsters outside of the cone.	16.96178	144.86931	3275	125	S5K36633.jpg
2016-12-08	06:45	HD new file started.	16.96175	144.86934	3275	124	2016-12-08T06_45_47.706823_S5K.jpg
2016-12-08	06:46	Seeing the rim in the rear camera.	16.96175	144.86936	3275	124	2016-12-08T06_46_01.682346_S5K.jpg
2016-12-08	06:46	Heading toward waypoint 7.	16.96173	144.86944	3281	126	2016-12-08T06_46_50.698463_S5K.jpg
2016-12-08	06:47	Flat sheet flows with cracks of yellow sediment.	16.96169	144.86955	3280	126	2016-12-08T06_47_14.683664_S5K.jpg
2016-12-08	06:47	<i>Okeanos</i> saw many chimneys at waypoint 7 but they had to leave the bottom.	16.96166	144.86958	3280	125	2016-12-08T06_47_41.680951_S5K.jpg
2016-12-08	06:48	Ropy lava flow but not as flat as before. No animals.	16.96147	144.86976	3283	126	2016-12-08T06_48_52.684898_S5K.jpg
2016-12-08	06:49	Ship is behind us and we are getting far away from it.	16.96138	144.86986	3282	125	S5K36862.jpg
2016-12-08	06:50	More than halfway there.	16.96131	144.86996	3281	126	2016-12-08T06_50_03.687679_S5K.jpg
2016-12-08	06:50	Still ropy flow and seeing sonar target.	16.96126	144.87003	3282	127	S5K36925.jpg
2016-12-08	06:51	Not flat here.	16.96123	144.87008	3283	126	2016-12-08T06_51_05.687895_S5K.jpg
2016-12-08	06:51	Ship is moving with us as we are near the end of our tether.	16.96121	144.87011	3281	142	2016-12-08T06_51_55.701255_S5K.jpg
2016-12-08	06:52	Coming in to venting and white staining Squat lobsters.	16.96117	144.87014	3281	149	S5K37037.jpg
2016-12-08	06:52	Smoke in the water.	16.96114	144.87014	3281	153	2016-12-08T06_52_52.692254_S5K.jpg
2016-12-08	06:53	Skinny chimlets around the white staining.	16.96112	144.87015	3281	153	2016-12-08T06_53_06.707093_S5K.jpg
2016-12-08	06:53	Highlights on, approaching WP 7 chimneys.	16.96109	144.87016	3281	158	2016-12-08T06_53_37.707987_S5K.jpg
2016-12-08	06:53	Big sonar target 20m out.	16.96107	144.87016	3280	159	2016-12-08T06_53_57.687207_S5K.jpg
2016-12-08	06:54	Can see something in the background.	16.96106	144.87015	3280	155	S5K37153.jpg
2016-12-08	06:54	Anemones and squat lobsters. Mussels as well.	16.96107	144.87014	3282	153	2016-12-08T06_54_31.700035_S5K.jpg
2016-12-08	06:54	Mussels!	16.96107	144.87014	3282	152	S5K37182.jpg
2016-12-08	06:55	Mussels and venting.	16.96110	144.87012	3282	153	2016-12-08T06_55_47.716123_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	06:57	Shimmering water.	16.96111	144.87012	3283	151	2016-12-08T06_57_02.721779_S5K.jpg
2016-12-08	06:57	White mollusk near the top.	16.96111	144.87011	3281	151	S5K37340.jpg
2016-12-08	06:57	More chimneys.	16.96108	144.87013	3278	152	2016-12-08T06_57_50.691862_S5K.jpg
2016-12-08	06:59	More diffuse flow here and not seeing black smoke.	16.96096	144.87020	3279	151	2016-12-08T06_59_12.705849_S5K.jpg
2016-12-08	06:59	Highlights off.	16.96094	144.87021	3277	157	2016-12-08T06_59_58.719270_S5K.jpg
2016-12-08	07:00	Going to look at the bright white patch.	16.96093	144.87022	3277	157	2016-12-08T07_00_05.690291_S5K.jpg
2016-12-08	07:00	Small and squat with some diffuse venting and couple chimlets on the top.	16.96087	144.87031	3282	152	2016-12-08T07_00_46.696325_S5K.jpg
2016-12-08	07:01	A few mussels.	16.96085	144.87033	3281	150	S5K37574.jpg
2016-12-08	07:02	White snails.	16.96081	144.87037	3280	149	2016-12-08T07_02_11.728363_S5K.jpg
2016-12-08	07:03	Going to try to sample the white snails and the chimney at the top.	16.96079	144.87038	3280	150	S5K37687.jpg
2016-12-08	07:03	Highlights on, further along WP 7. Sample white snails and old chimney.	16.96079	144.87038	3280	150	2016-12-08T07_03_21.729753_S5K.jpg
2016-12-08	07:03	Coming into the chimney for sampling.	16.96077	144.87040	3280	156	
2016-12-08	07:04	Not actively venting off the top.	16.96077	144.87041	3280	166	2016-12-08T07_04_52.816716_S5K.jpg
2016-12-08	07:05	Touch.	16.96078	144.87041	3282	162	S5K37805.jpg
2016-12-08	07:05	Approaching the chimney again.	16.96081	144.87040	3279	166	2016-12-08T07_05_29.721870_S5K.jpg
2016-12-08	07:07	Highlights off.	16.96079	144.87042	3281	174	S5K37946.jpg
2016-12-08	07:11	Shrimp, limpets, snails, squat lobsters and crabs.	16.96075	144.87044	3281	233	2016-12-08T07_11_03.739005_S5K.jpg
2016-12-08	07:11	Highlights on.	16.96075	144.87044	3281	233	2016-12-08T07_11_45.754204_S5K.jpg
2016-12-08	07:13	Preparing to suction sample the white snails. They will go to jar #6.	16.96074	144.87044	3281	233	2016-12-08T07_13_10.720118_S5K.jpg
2016-12-08	07:14	Can't see suction into jar.	16.96074	144.87043	3281	234	2016-12-08T07_14_48.717052_S5K.jpg
2016-12-08	07:15	Now can see flow into jar.	16.96074	144.87042	3281	234	
2016-12-08	07:15	Some broke when sucked up.	16.96074	144.87041	3281	234	2016-12-08T07_15_35.731479_S5K.jpg
2016-12-08	07:16	S41-Bio-10 Suction of white snails into jar #6 from a cluster of 4. Looked like all four went into the hose but only one has come into the jar.	16.96079	144.87041	3280	236	2016-12-08T07_16_20.703918_S5K.jpg
2016-12-08	07:18	Trying to figure out how to clear the hose and keep the snails inside of it.	16.96088	144.87030	3281	260	
2016-12-08	07:19	Suction hose stowed.	16.96078	144.87037	3281	258	
2016-12-08	07:19	Highlights off.	16.96078	144.87038	3281	259	2016-12-08T07_19_28.727621_S5K.jpg
2016-12-08	07:19	Indexing the jars to #8.	16.96078	144.87038	3281	259	2016-12-08T07_19_29.725075_S5K.jpg
2016-12-08	07:19	Last task is to grab the spire at the top of this structure.	16.96078	144.87038	3281	259	
2016-12-08	07:20	Facing west while sampling,	16.96077	144.87039	3281	267	S5K38749.jpg
2016-12-08	07:21	S41-Geo-11 Inactive sulfide that was on the top of the chimney at waypoint #7. Looking to the west.	16.96076	144.87040	3281	268	2016-12-08T07_21_54.706742_S5K.jpg

Date	Time	S41 – Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	07:22	Sample has some limpets and other biology on the top.	16.96076	144.87039	3281	269	S5K38862.jpg
2016-12-08	07:23	Going to the aft biobox.	16.96076	144.87039	3281	269	S5K38881.jpg
2016-12-08	07:24	Made it in the stbd side of the aft biobox.	16.96075	144.87040	3281	271	S5K38991.jpg
2016-12-08	07:25	Highlights off.	16.96073	144.87039	3281	271	S5K39018.jpg
2016-12-08	07:26	Coming off bottom at the end of this dive.	16.96080	144.87025	3276	282	
2016-12-08	07:27	HD recording off.	16.96094	144.87014	3268	321	2016-12-08T07_27_16.723944_S5K.jpg

Table 6.6-8 Dive S42 – Hafa Adai

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	22:54	HD recording on.	16.96182	144.86919	3244	133	S5K07106.jpg
2016-12-08	22:56	Can see the bottom in the rear camera. Looks like the rim.	16.96183	144.86906	3276	130	
2016-12-08	22:56	Landed right in the crater of the cinder cone.	16.96183	144.86906	3276	128	2016-12-08T22_56_18.737951_S5K.jpg
2016-12-08	22:56	Doing a white balance on the camera.	16.96183	144.86905	3275	125	2016-12-08T22_56_44.729785_S5K.jpg
2016-12-08	22:57	Looking at the bottom with quite a few squat lobsters.	16.96183	144.86905	3275	125	
2016-12-08	22:58	Want to find Mkr-171 to find a good site for the biology deployment.	16.96183	144.86905	3275	126	
2016-12-08	22:59	Pilots can see the marker.	16.96182	144.86912	3276	102	2016-12-08T22_59_46.742652_S5K.jpg
2016-12-08	23:00	Nice overview of the site with Mkr-171.	16.96180	144.86914	3276	102	2016-12-08T23_00_06.729245_S5K.jpg
2016-12-08	23:00	Taking a look at the site before deploying anything. The marker is on the sides of the crater.	16.96176	144.86917	3277	67	S5K07496.jpg
2016-12-08	23:02	Nice view of Mkr-171.	16.96173	144.86921	3276	23	S5K07581.jpg
2016-12-08	23:03	Getting a closer look for a good snail site.	16.96172	144.86924	3276	17	S5K07646.jpg
2016-12-08	23:03	There are a lot of snails directly in front of the basket.	16.96172	144.86925	3277	11	S5K07678.jpg
2016-12-08	23:04	Mkr-171 is inside the distinct cone at waypoint #6. Looking almost due north but on the east-side of the cone.	16.96171	144.86925	3278	12	S5K07702.jpg
2016-12-08	23:05	Basket view of the hoop.	16.96172	144.86923	3278	6	
2016-12-08	23:06	Retrieving the hoop from the basket.	16.96173	144.86921	3278	6	2016-12-08T23_06_17.740427_S5K.jpg
2016-12-08	23:06	Deploying the temperature array.	16.96173	144.86920	3278	6	S5K07845.jpg
2016-12-08	23:06	Highlights on, deploying hula hoop.	16.96172	144.86919	3278	6	2016-12-08T23_06_46.768020_S5K.jpg
2016-12-08	23:07	Array is being held in the stbd manipulator while retrieving the ROV temperature probe.	16.96171	144.86918	3278	5	2016-12-08T23_07_36.752238_S5K.jpg
2016-12-08	23:08	Probe site.	16.96170	144.86917	3278	6	
2016-12-08	23:08	Saw 27°C at that site.	16.96170	144.86917	3278	6	
2016-12-08	23:08	Seeing 45deg at second probe. Not a good view on science cam.	16.96170	144.86918	3278	6	S5K07990.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	23:09	Over 65deg.....96deg....	16.96170	144.86919	3278	7	2016-12-08T23_09_51.749849_S5K.jpg
2016-12-08	23:10	High temp was 97.3 at this probe.	16.96170	144.86920	3278	7	S5K08086.jpg
2016-12-08	23:11	HFS wand in the holster is measuring 5.4°C.	16.96171	144.86921	3278	7	2016-12-08T23_11_30.749881_S5K.jpg
2016-12-08	23:11	Lifting up ROV probe.	16.96171	144.86921	3278	7	2016-12-08T23_11_58.743424_S5K.jpg
2016-12-08	23:12	Highlights off while measuring temp. On again to position hula hoop on seafloor.	16.96172	144.86922	3278	8	2016-12-08T23_12_39.756613_S5K.jpg
2016-12-08	23:14	Touching in 2 places now.	16.96174	144.86924	3278	8	2016-12-08T23_13_59.767258_S5K.jpg
2016-12-08	23:14	Getting ready to break the bands to deploy the array.	16.96175	144.86924	3278	8	S5K08340.jpg
2016-12-08	23:15	Breaking the bands to have the temperature net deploy on the surface.	16.96175	144.86923	3278	8	2016-12-08T23_15_47.741352_S5K.jpg
2016-12-08	23:17	Most of the bands are broken.	16.96176	144.86921	3278	8	2016-12-08T23_17_35.749202_S5K.jpg
2016-12-08	23:18	Switching arms for band breaking.	16.96176	144.86921	3278	8	2016-12-08T23_18_03.741829_S5K.jpg
2016-12-08	23:19	One more band to go.	16.96175	144.86922	3278	8	S5K08624.jpg
2016-12-08	23:20	All are released and now need to deploy on the seafloor.	16.96174	144.86923	3278	8	2016-12-08T23_20_22.752869_S5K.jpg
2016-12-08	23:21	DEPLOY Temperature Array on snails over warm flow at the base of Mkr-171 on the east side of the small cone.	16.96172	144.86922	3278	8	S5K08731.jpg
2016-12-08	23:22	Discussing the placement of the temperature array.	16.96171	144.86921	3278	8	S5K08794.jpg
2016-12-08	23:22	Deployment is complete.	16.96171	144.86922	3278	8	2016-12-08T23_22_52.772904_S5K.jpg
2016-12-08	23:25	Discussing the next order of sampling.	16.96170	144.86924	3278	8	2016-12-08T23_25_22.754591_S5K.jpg
2016-12-08	23:26	Preparing to take HFS sensor readings.	16.96170	144.86923	3278	8	2016-12-08T23_26_39.762129_S5K.jpg
2016-12-08	23:27	20m offset from the Sentry bathymetry compared to the ROV nav. We are about 20m west of the bathymetry map (currently on the east side, inside rim).	16.96171	144.86923	3278	8	S5K09090.jpg
2016-12-08	23:28	In the holster getting a temperature of 6.9-7.1°C.	16.96173	144.86922	3278	8	
2016-12-08	23:28	Highlights off.	16.96173	144.86922	3278	7	2016-12-08T23_28_49.758901_S5K.jpg
2016-12-08	23:30	Going to move across the array to get a good distribution of readings.	16.96175	144.86921	3278	7	2016-12-08T23_30_14.775113_S5K.jpg
2016-12-08	23:30	HD recording temporarily switched to pilot cam to show hula array from above.	16.96175	144.86921	3278	7	2016-12-08T23_30_54.751303_S5K.jpg
2016-12-08	23:31	First reading outside of the array.	16.96176	144.86922	3278	3	2016-12-08T23_31_36.762049_S5K.jpg
2016-12-08	23:31	HD recording back to science cam after a few minutes. Arm overtop of array while sampling water.	16.96176	144.86922	3278	3	2016-12-08T23_31_43.769913_S5K.jpg
2016-12-08	23:33	Waiting for HFS to stabilize.	16.96174	144.86923	3278	3	2016-12-08T23_33_08.747170_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	23:33	First: Temp=5.5deg variable pH=6.6 O2=2.7 ml/l.	16.96172	144.86923	3278	3	S5K09487.jpg
2016-12-08	23:34	Picking up the wand and moving into the array.	16.96172	144.86924	3278	3	
2016-12-08	23:36	Second reading (near an instrument in the array) Variable reading: Temp=6.1 pH=6.59 O2=2.71 ml/l.	16.96172	144.86924	3278	3	2016-12-08T23_36_10.759706_S5K.jpg
2016-12-08	23:37	Ready for another move to the right.	16.96170	144.86924	3278	3	
2016-12-08	23:37	In between three sensors here.	16.96170	144.86923	3278	3	S5K09712.jpg
2016-12-08	23:38	Bit warmer here and crabs surrounding probe.	16.96170	144.86923	3278	3	S5K09751.jpg
2016-12-08	23:38	Third: Temp=17.9 pH=6.0 O2=2.0 At this site.	16.96171	144.86923	3278	3	2016-12-08T23_38_40.784756_S5K.jpg
2016-12-08	23:39	Going to take a water sample. Pausing sensor readings.	16.96171	144.86923	3278	3	
2016-12-08	23:39	HD recording switched to pilot cam again.	16.96172	144.86922	3278	3	2016-12-08T23_39_41.775697_S5K.jpg
2016-12-08	23:40	HD recording back to science cam.	16.96172	144.86921	3278	3	2016-12-08T23_40_23.782389_S5K.jpg
2016-12-08	23:40	S42-HFS-01 Start 23:40. Unfiltered Bag #22	16.96172	144.86921	3278	3	2016-12-08T23_40_32.762757_S5K.jpg
2016-12-08	23:41	Water sample at same location as sensor reading #3.	16.96172	144.86920	3278	2	2016-12-08T23_41_43.768978_S5K.jpg
2016-12-08	23:42	Can see how the recorders have dropped down into the substrate.	16.96173	144.86919	3278	2	2016-12-08T23_42_30.919225_S5K.jpg
2016-12-08	23:43	Stop. Tmax=25.6 Tavg=21.0 vol=425 T2=12.2	16.96173	144.86918	3278	2	2016-12-08T23_43_26.772155_S5K.jpg
2016-12-08	23:44	S42-HFS-02 Start 23:44. Filtered Bag #21. At the same location as HFS-01	16.96174	144.86919	3278	2	2016-12-08T23_44_17.786454_S5K.jpg
2016-12-08	23:45	Can't see exhaust on these samples as the hose was lost during descent.	16.96174	144.86921	3278	2	S5K10196.jpg
2016-12-08	23:47	Stop. Tmax=30.5 Tavg=25.7 vol=425 T2=12.1	16.96173	144.86923	3278	2	2016-12-08T23_47_21.762281_S5K.jpg
2016-12-08	23:47	Can see palm worms. Wand was adjacent to recorder #5.	16.96174	144.86923	3278	2	
2016-12-08	23:48	Going back to HFS sensor readings.	16.96173	144.86924	3278	2	
2016-12-08	23:49	Getting a second sensor reading at Location #3 where the water sample was taken.	16.96174	144.86925	3278	2	S5K10411.jpg
2016-12-08	23:49	Temp=24deg pH=5.81 O2=1.38 Readings changed since first reading here at Location #3.	16.96174	144.86926	3278	2	2016-12-08T23_49_55.781460_S5K.jpg
2016-12-08	23:50	Moving the wand to the right.	16.96173	144.86926	3278	2	
2016-12-08	23:51	One snail rode over to Location #4 of sensor readings.	16.96173	144.86926	3278	2	2016-12-08T23_51_06.758067_S5K.jpg
2016-12-08	23:51	Location #4 is near logger #1.	16.96173	144.86926	3278	2	1481241107957S5K10560.jpg
2016-12-08	23:52	HFS computer clock is at 1:52:03 at 23:42 on the logging clocks.	16.96173	144.86925	3278	2	2016-12-08T23_52_09.782338_S5K.jpg
2016-12-08	23:54	Location #4 Temp=14.5 pH=6.14 O2=1.94 next to recorder #1.	16.96174	144.86924	3278	2	2016-12-08T23_54_19.779934_S5K.jpg
2016-12-08	23:55	Going to move the wand to the center of the array.	16.96173	144.86923	3278	2	

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-08	23:56	Could not move into the center so moving up along the array but near the edge of the copper.	16.96173	144.86922	3278	2	1481241382931S5K10835.jpg
2016-12-08	23:57	This will be Location #5 so far it is the warmest. 36°C near logger #24.	16.96174	144.86920	3278	2	2016-12-08T23_57_23.761328_S5K.jpg
2016-12-08	23:58	HD new file started.	16.96173	144.86919	3278	2	2016-12-08T23_58_18.782977_S5K.jpg
2016-12-08	23:58	That is not logger #24 it is logger #8...clear image.	16.96173	144.86918	3278	2	2016-12-08T23_58_58.757025_S5K.jpg
2016-12-09	00:00	Location #5 Temp=29 pH=5.5 O2=1.1 ml/l	16.96173	144.86918	3278	2	1481241601086S5K11053.jpg
2016-12-09	00:00	Moving the wand to the left.	16.96172	144.86919	3278	2	
2016-12-09	00:01	Snail is still hitchhiking.	16.96172	144.86919	3278	1	1481241718117S5K11170.jpg
2016-12-09	00:02	Temperature is dropping down a bit.	16.96172	144.86918	3278	1	2016-12-09T00_02_24.762831_S5K.jpg
2016-12-09	00:02	This is location #6.	16.96172	144.86918	3278	1	2016-12-09T00_02_38.776121_S5K.jpg
2016-12-09	00:03	Next to logger #09.	16.96171	144.86919	3278	1	2016-12-09T00_03_23.783031_S5K.jpg
2016-12-09	00:03	Reading #6: Temperature is changing so will wait.	16.96171	144.86919	3278	1	2016-12-09T00_03_40.771019_S5K.jpg
2016-12-09	00:04	Reading #6: Temp=13.6 pH=6.0 O2=1.85 ml/l.	16.96171	144.86920	3278	1	2016-12-09T00_04_37.759333_S5K.jpg
2016-12-09	00:05	Moving the wand to the left next.	16.96172	144.86921	3278	1	2016-12-09T00_05_28.786222_S5K.jpg
2016-12-09	00:06	Mostly snails and less crabs here at Reading #7.	16.96172	144.86921	3278	1	2016-12-09T00_06_01.773476_S5K.jpg
2016-12-09	00:07	Reading #7 is near logger green #15 is to the bottom right (above white #10). There is a green logger is closer but buried.	16.96172	144.86924	3278	1	2016-12-09T00_07_44.782830_S5K.jpg
2016-12-09	00:10	That might be blue #6...need to examine image.	16.96174	144.86923	3278	1	1481242241004S5K11693.jpg
2016-12-09	00:11	Probe is on a red logger.	16.96174	144.86921	3278	1	2016-12-09T00_11_42.794717_S5K.jpg
2016-12-09	00:11	Reading #7: Temp=9.2 pH=6.3 O2=2.35 ml/l.	16.96175	144.86921	3278	1	2016-12-09T00_11_58.775453_S5K.jpg
2016-12-09	00:12	Moving the wand.	16.96176	144.86919	3278	1	2016-12-09T00_12_53.795913_S5K.jpg
2016-12-09	00:13	Moved to the left in the hole area of hotter flow.	16.96176	144.86919	3278	1	2016-12-09T00_13_14.789296_S5K.jpg
2016-12-09	00:13	Temperature is over 70°C.	16.96176	144.86918	3278	1	1481242412049S5K11864.jpg
2016-12-09	00:13	Sensors off as it is too hot.	16.96176	144.86918	3278	1	1481242429932S5K11882.jpg
2016-12-09	00:15	pH did get down to 4 and O2 was down to .4 before stopping the sensors.	16.96175	144.86919	3278	1	1481242515868S5K11968.jpg
2016-12-09	00:16	This may be near logger #26???	16.96175	144.86920	3278	0	1481242563830S5K12016.jpg
2016-12-09	00:19	S42-HFS-03 Start 00:19. Unfiltered Piston #1 This is the hole inside the temperature array with hotter water.	16.96171	144.86922	3278	0	2016-12-09T00_19_06.811418_S5K.jpg
2016-12-09	00:20	Have not taken a reading at location #8 otherwise except for what will come with this water sample.	16.96172	144.86923	3278	0	2016-12-09T00_20_21.787835_S5K.jpg
2016-12-09	00:22	Stop Tmax=124 Tavg=120 vol=650 T2=40.	16.96170	144.86922	3278	359	1481242960858S5K12413.jpg
2016-12-09	00:24	S42-HFS-04 Start 00:24 Filtered Piston #3 Same location as reading #8 inside the temperature array near Mkr-171.	16.96174	144.86921	3278	359	1481243066915S5K12519.jpg
2016-12-09	00:26	Stop. Tmax=128.1 Tavg=126 vol=308 T2=40.	16.96175	144.86923	3278	359	1481243160223S5K12612.jpg
2016-12-09	00:26	Moved while sampling at the end.	16.96176	144.86923	3278	359	2016-12-09T00_26_52.806783_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	00:27	Picked up the wand vertically and did not move from side to side.	16.96176	144.86924	3278	359	2016-12-09T00_27_12.793484_S5K.jpg
2016-12-09	00:28	Pulling wand vertically another inch (think last time was up 2 inches).	16.96175	144.86922	3278	359	1481243328831S5K12781.jpg
2016-12-09	00:29	Temp dropped from 80s to 60s so doing a little more adjusting.	16.96175	144.86922	3278	359	2016-12-09T00_29_24.794195_S5K.jpg
2016-12-09	00:30	Temperature is around 66deg.	16.96175	144.86922	3278	359	2016-12-09T00_30_15.807636_S5K.jpg
2016-12-09	00:31	S42-HFS-05 Start 00:31. LVB #24 at location #8 in the array. Brought wand up from hot water just sampled at same exact location a few inches to get cooler water.	16.96173	144.86921	3278	359	2016-12-09T00_31_53.811769_S5K.jpg
2016-12-09	00:34	Ship moved the wand in and temperature is rising. But now at 22deg.	16.96172	144.86920	3278	356	
2016-12-09	00:34	Only 20deg now and wand is jiggling a bit left/right.	16.96173	144.86920	3278	356	2016-12-09T00_34_32.800444_S5K.jpg
2016-12-09	00:34	Temp is now going up.	16.96174	144.86920	3278	355	1481243694123S5K13146.jpg
2016-12-09	00:35	Going to be too hot now. Need to come straight up.	16.96174	144.86921	3278	355	1481243709079S5K13161.jpg
2016-12-09	00:35	Came up and temperature is in the 60s.	16.96172	144.86925	3278	355	1481243733196S5K13185.jpg
2016-12-09	00:36	Down to the 30s now.	16.96175	144.86926	3278	355	2016-12-09T00_36_01.788782_S5K.jpg
2016-12-09	00:37	Temp is 25 degrees.	16.96176	144.86924	3278	354	2016-12-09T00_37_21.801970_S5K.jpg
2016-12-09	00:37	Going to move intake a little to try to increase the temperature.	16.96176	144.86923	3278	354	2016-12-09T00_37_48.802370_S5K.jpg
2016-12-09	00:38	OK intake is repositioned. Temperature is now 52 degrees.	16.96175	144.86922	3278	354	2016-12-09T00_38_48.791663_S5K.jpg
2016-12-09	00:47	Shimmering water is obscuring the view in the science camera.	16.96174	144.86921	3278	353	2016-12-09T00_47_11.791494_S5K.jpg
2016-12-09	00:48	Drop in the temperature while sampling again.	16.96174	144.86921	3278	353	1481244488979S5K13941.jpg
2016-12-09	00:53	Stop. Tmax=100.3 Tavg=38.6 vol=3228 T2=20.	16.96177	144.86920	3278	353	
2016-12-09	00:55	S42-HFS-06 Start 00:55 RNA filter #10 At location #8 (of array readings) inside the temperature array near Mkr-171. Same exact location as HFS-05.	16.96174	144.86924	3278	353	
2016-12-09	00:59	Temperature is in the 20s now and want to get it a bit higher by moving the wand vertically a bit.	16.96174	144.86923	3278	353	
2016-12-09	01:00	Went down with the probe and temp is going down.	16.96175	144.86922	3278	353	2016-12-09T01_00_08.809524_S5K.jpg
2016-12-09	01:00	HD new file started.	16.96175	144.86922	3278	353	2016-12-09T01_00_10.815030_S5K.jpg
2016-12-09	01:00	Probe came out completely of hole and now is going back down.	16.96176	144.86922	3278	353	2016-12-09T01_00_31.834035_S5K.jpg
2016-12-09	01:00	Going down some more with the probe.	16.96175	144.86921	3278	353	2016-12-09T01_00_50.822344_S5K.jpg
2016-12-09	01:01	Wand came out again. Trying to go straight down.	16.96175	144.86924	3278	352	1481245282885S5K14735.jpg

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2016-12-09	01:01	Slight move to right and temp came up.	16.96175	144.86924	3278	352	1481245313195S5K14765.jpg
2016-12-09	01:02	Up to 30 and high 20s.	16.96175	144.86924	3278	352	2016-12-09T01_02_11.836917_S5K.jpg
2016-12-09	01:05	Temp is down below 20 but just came up again.	16.96173	144.86923	3278	352	1481245507242S5K14959.jpg
2016-12-09	01:07	Wand is moving further down. Temperature is dropping.	16.96172	144.86922	3278	352	1481245626973S5K15079.jpg
2016-12-09	01:07	Went down and just to the right. Temp is coming back up.	16.96172	144.86922	3278	352	2016-12-09T01_07_57.822475_S5K.jpg
2016-12-09	01:14	Temperature has dropped again.	16.96174	144.86921	3278	352	2016-12-09T01_14_06.822467_S5K.jpg
2016-12-09	01:14	Moved slightly to the right and temperature went up.	16.96174	144.86921	3278	352	1481246072047S5K15524.jpg
2016-12-09	01:15	Temperature came up as lifted the wand.	16.96173	144.86922	3278	352	2016-12-09T01_15_20.837070_S5K.jpg
2016-12-09	01:16	Wand is stretching the netting but still in this square.	16.96173	144.86923	3278	352	2016-12-09T01_16_30.837724_S5K.jpg
2016-12-09	01:17	That small move brought the temperature to the 50s.	16.96174	144.86922	3278	352	2016-12-09T01_16_59.832925_S5K.jpg
2016-12-09	01:21	Stop. Tmax=58.6 Tavg=30.2 vol=3000 T2=20.	16.96175	144.86926	3278	351	2016-12-09T01_21_15.856518_S5K.jpg
2016-12-09	01:21	This was still at Location #8 in the array.	16.96174	144.86925	3278	351	
2016-12-09	01:22	Sensor readings at Location #8: Temp=54 pH=5.06 O2=1.05ml/l	16.96174	144.86925	3278	351	1481246531948S5K15984.jpg
2016-12-09	01:25	Done at Location #8 in the array.	16.96173	144.86925	3278	351	
2016-12-09	01:25	Moving to the left.	16.96174	144.86924	3278	351	1481246737344S5K16189.jpg
2016-12-09	01:26	Location #9 closeup.	16.96175	144.86922	3278	351	2016-12-09T01_26_27.825353_S5K.jpg
2016-12-09	01:26	Lasers are on and trying to get a clear view to read the recorder numbers.	16.96175	144.86921	3278	351	2016-12-09T01_26_50.850798_S5K.jpg
2016-12-09	01:29	Can see recorder 11 below to the right.	16.96175	144.86919	3278	351	2016-12-09T01_29_09.852285_S5K.jpg
2016-12-09	01:29	Location #9: Temp=8.3 pH=6.3 O2=2.65 ml/l	16.96174	144.86920	3278	351	2016-12-09T01_29_28.839426_S5K.jpg
2016-12-09	01:32	Vehicle temperature is over 4°C while parked here.	16.96172	144.86923	3278	350	2016-12-09T01_32_34.858842_S5K.jpg
2016-12-09	01:33	Vehicle bumped and wand moved.	16.96171	144.86923	3278	350	2016-12-09T01_33_22.834808_S5K.jpg
2016-12-09	01:35	S42-HFS-07 Start 01:35 Unfiltered Bag#20. Location near the edge of the array near the last reading but after the vehicle was bumped.	16.96170	144.86921	3278	350	
2016-12-09	01:37	Very near location #9 but temperature came down.	16.96172	144.86918	3278	350	2016-12-09T01_37_26.842925_S5K.jpg
2016-12-09	01:38	Stop. Tmax=7.1 Tavg=6.0 vol=452 T2=5.4	16.96173	144.86919	3278	350	2016-12-09T01_38_16.825912_S5K.jpg
2016-12-09	01:39	S42-HFS-08 Start 01:39 Filtered Bag #19 Same location as HFS-07 near Location #9 in the array at Mkr-171 (started a bit later as valve needed to move).	16.96177	144.86920	3278	350	2016-12-09T01_39_51.858412_S5K.jpg
2016-12-09	01:44	Stop. Tmax=6.1 Tavg=5.2 vol=450 T2=4.7	16.96176	144.86920	3278	349	2016-12-09T01_44_18.863396_S5K.jpg
2016-12-09	01:45	Pulling up wand but not done yet.	16.96176	144.86919	3278	349	2016-12-09T01_45_28.866508_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	01:46	Looking for a site to deploy the MAPR.	16.96176	144.86920	3278	349	2016-12-09T01_46_03.826388_S5K.jpg
2016-12-09	01:46	Just did a quick temperature check at that location for deploying the MAPR.	16.96175	144.86920	3278	349	2016-12-09T01_46_33.856117_S5K.jpg
2016-12-09	01:47	Stowing the HFS wand.	16.96174	144.86920	3278	349	
2016-12-09	01:51	Coordinating what we are doing next.	16.96171	144.86925	3278	349	2016-12-09T01_51_18.849355_S5K.jpg
2016-12-09	01:53	DEPLOY: First robo-mussel on top of temperature array.	16.96172	144.86924	3278	349	2016-12-09T01_53_07.860638_S5K.jpg
2016-12-09	01:54	DEPLOY: 2nd robo-mussel near top of the array.	16.96172	144.86922	3278	349	2016-12-09T01_54_30.844555_S5K.jpg
2016-12-09	01:55	DEPLOY: 3rd robo-mussel lower right of array.	16.96171	144.86921	3278	349	1481248550961S5K18003.jpg
2016-12-09	01:56	Reaching for robo-snail.	16.96171	144.86917	3278	349	2016-12-09T01_56_34.862832_S5K.jpg
2016-12-09	01:57	Robo-snail fell in front of the array.	16.96172	144.86919	3278	349	2016-12-09T01_57_19.846457_S5K.jpg
2016-12-09	01:58	Moved robo-snail onto bottom of the array.	16.96173	144.86920	3278	349	1481248707124S5K18159.jpg
2016-12-09	02:00	Reaching for the MAPR.	16.96174	144.86919	3278	349	2016-12-09T02_00_02.877739_S5K.jpg
2016-12-09	02:01	DEPLOY: MAPR to the left and in front of the array.	16.96174	144.86921	3278	349	1481248905923S5K18358.jpg
2016-12-09	02:03	Looks like robo-mussels are: yellow ball, lower left; red tape, upper; black tape, lower right.	16.96174	144.86924	3278	349	2016-12-09T02_03_15.868237_S5K.jpg
2016-12-09	02:05	Highlights on to show temp array and robo-animals.	16.96174	144.86925	3278	350	2016-12-09T02_05_23.863697_S5K.jpg
2016-12-09	02:07	Highlights off.	16.96176	144.86925	3278	350	2016-12-09T02_07_30.860485_S5K.jpg
2016-12-09	02:07	Going to survey and look for dead snail shells for Verena.	16.96176	144.86925	3277	348	1481249277115S5K18729.jpg
2016-12-09	02:08	Up and down once to video temperature array.	16.96178	144.86925	3277	348	2016-12-09T02_08_47.868573_S5K.jpg
2016-12-09	02:09	Highlights of Hula array as we leave.	16.96179	144.86926	3277	350	1481249339000S5K18791.jpg
2016-12-09	02:09	Turning starboard.	16.96178	144.86925	3276	349	2016-12-09T02_09_20.869892_S5K.jpg
2016-12-09	02:11	Facing SW now.	16.96176	144.86918	3277	226	1481249478855S5K18931.jpg
2016-12-09	02:12	Think we see the snail graveyard.	16.96177	144.86912	3279	243	1481249520333S5K18972.jpg
2016-12-09	02:13	We are at the south rim where the floor meets the wall.	16.96173	144.86906	3282	186	2016-12-09T02_13_12.860180_S5K.jpg
2016-12-09	02:13	Squat lobsters, hairy (but dead) snails and some white snails.	16.96173	144.86906	3284	176	2016-12-09T02_13_50.879796_S5K.jpg
2016-12-09	02:14	Left white snail is alive.	16.96173	144.86908	3284	161	2016-12-09T02_14_35.886968_S5K.jpg
2016-12-09	02:14	Highlights off as settle by snail graveyard. Back on while suctioning snail shells and white snail.	16.96173	144.86908	3284	161	1481249680287S5K19132.jpg
2016-12-09	02:14	All the hairy snails are dead as they rolled down the hill.	16.96174	144.86908	3284	161	2016-12-09T02_14_52.866305_S5K.jpg
2016-12-09	02:15	White snails are scavengers.	16.96174	144.86909	3284	159	2016-12-09T02_15_12.856710_S5K.jpg
2016-12-09	02:15	Going to suction the dead snail shells first into jar #7.	16.96174	144.86909	3284	159	1481249726029S5K19178.jpg
2016-12-09	02:16	Suction is on jar #7 now.	16.96174	144.86910	3284	160	1481249778912S5K19231.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	02:16	Can see flow into the jar.	16.96174	144.86910	3284	160	2016-12-09T02_16_46.879459_S5K.jpg
2016-12-09	02:17	Ready to suction!	16.96174	144.86911	3284	160	1481249824141S5K19276.jpg
2016-12-09	02:17	Suction at half to pull the dead shells.	16.96175	144.86911	3284	160	
2016-12-09	02:18	S42-Bio-09 Suction of many dead snails into Jar #7.	16.96174	144.86911	3284	160	2016-12-09T02_18_00.887841_S5K.jpg
2016-12-09	02:19	The snails roll so easily as they are very light.	16.96175	144.86911	3284	160	1481249965117S5K19417.jpg
2016-12-09	02:20	Tiny (baby) squat lobster just below a suction.	16.96176	144.86911	3284	160	2016-12-09T02_20_04.880446_S5K.jpg
2016-12-09	02:21	Over 8 shells in the jar.	16.96178	144.86910	3284	160	1481250070938S5K19523.jpg
2016-12-09	02:23	Hose clogged maybe so shook the wand and several shells came out.	16.96176	144.86907	3284	161	1481250196160S5K19648.jpg
2016-12-09	02:24	Two went up.	16.96176	144.86907	3284	161	2016-12-09T02_24_07.892733_S5K.jpg
2016-12-09	02:24	No shells have been coming into the jar.	16.96175	144.86907	3284	160	2016-12-09T02_24_44.865162_S5K.jpg
2016-12-09	02:25	Shaking them out of the hose	16.96176	144.86908	3284	160	1481250337287S5K19789.jpg
2016-12-09	02:26	Indexing to jar #8 and bringing it up to full suction to clear the hose.	16.96175	144.86909	3284	160	1481250374087S5K19826.jpg
2016-12-09	02:26	Many snails went into the flush jar #8.	16.96175	144.86910	3284	160	
2016-12-09	02:27	Enough of this sample into jar #7 & #8.	16.96175	144.86910	3284	160	
2016-12-09	02:27	Next want to get some of the white snails into jar #6.	16.96175	144.86911	3284	160	
2016-12-09	02:29	White one fell out.	16.96177	144.86912	3284	160	
2016-12-09	02:30	White snail got suctioned but not coming into the jar as many of the dead shells entered Jar #6.	16.96178	144.86915	3284	160	
2016-12-09	02:31	Can see down the hose and the clog of snails in it.	16.96180	144.86917	3284	160	2016-12-09T02_30_56.880120_S5K.jpg
2016-12-09	02:31	The white snail came out of the hose.	16.96181	144.86919	3284	163	
2016-12-09	02:32	Still working on clearing the hose to get a white snail.	16.96183	144.86920	3284	162	2016-12-09T02_32_09.887199_S5K.jpg
2016-12-09	02:34	Not in the hose.	16.96180	144.86917	3284	163	1481250851245S5K20303.jpg
2016-12-09	02:34	Still on full suction trying to keep this white snail in the hose.	16.96177	144.86914	3284	165	1481250890152S5K20342.jpg
2016-12-09	02:37	Tried to shake the hose to deposit the snail in the biobox but didn't come out.	16.96173	144.86905	3284	165	2016-12-09T02_36_55.896206_S5K.jpg
2016-12-09	02:37	Highlights off.	16.96174	144.86904	3284	165	1481251042130S5K20494.jpg
2016-12-09	02:39	Trying to suction another white one while the other one is stuck in the hose.	16.96172	144.86903	3284	165	2016-12-09T02_39_10.905784_S5K.jpg
2016-12-09	02:39	Got a second one in the hose and reaching for the biobox.	16.96173	144.86906	3284	165	1481251193398S5K20645.jpg
2016-12-09	02:40	S42-Bio-10 Suction of a single white snail (alive) in the Snail Graveyard. Placed in the aft-aft quadrant of the biobox. I	16.96173	144.86906	3284	165	2016-12-09T02_40_25.910729_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	02:41	Next will be a suction of crud from underneath all the dead snails.	16.96174	144.86910	3284	165	2016-12-09T02_41_56.901616_S5K.jpg
2016-12-09	02:42	S42-Bio-11 Full strength suction of crud into Jar #4 at the Snail Graveyard. A couple of suctions under the dead shells.	16.96175	144.86910	3284	160	1481251347111S5K20799.jpg
2016-12-09	02:43	Jar is very cloudy.	16.96176	144.86912	3284	161	
2016-12-09	02:44	Indexing to jar #5 since jar #8 is full of dead shells.	16.96176	144.86911	3284	161	
2016-12-09	02:46	Jar #5 has some of the sediment now from this site.	16.96176	144.86913	3283	158	
2016-12-09	02:46	Squat lobsters are on the wall and there are a few anemones.	16.96175	144.86912	3282	147	1481251596017S5K21048.jpg
2016-12-09	02:46	Coming up the wall to a milky venting site.	16.96176	144.86913	3280	123	1481251616026S5K21068.jpg
2016-12-09	02:47	Coming up to the rim	16.96177	144.86916	3278	124	2016-12-09T02_47_19.893441_S5K.jpg
2016-12-09	02:47	Probably where the snails came from before dying and rolling down the hill.	16.96177	144.86917	3278	123	2016-12-09T02_47_39.917525_S5K.jpg
2016-12-09	02:48	Looking to the right.	16.96174	144.86919	3277	125	1481251692223S5K21144.jpg
2016-12-09	02:48	Looks like barnacles are around that anemone.	16.96173	144.86921	3277	125	2016-12-09T02_48_23.898052_S5K.jpg
2016-12-09	02:48	Looks like barnacles.	16.96172	144.86922	3277	124	2016-12-09T02_48_44.919077_S5K.jpg
2016-12-09	02:48	Highlights on, barnacles on rocks at venting above snail graveyard.	16.96172	144.86922	3278	124	2016-12-09T02_48_52.899194_S5K.jpg
2016-12-09	02:50	Closeup of barnacles with anemone at bottom edge.	16.96172	144.86921	3278	118	1481251823332S5K21275.jpg
2016-12-09	02:51	Looking for a rock that has barnacles on it to sample.	16.96168	144.86922	3278	118	1481251882921S5K21335.jpg
2016-12-09	02:51	Want the rock with the squat lobster on it.	16.96168	144.86922	3278	118	1481251904057S5K21356.jpg
2016-12-09	02:52	That was too big so going for a smaller one.	16.96171	144.86922	3278	119	
2016-12-09	02:53	Can put the rock in the fwd-stbd quarter.	16.96171	144.86920	3278	119	1481251989331S5K21441.jpg
2016-12-09	02:54	S42-Geo-12 Rock holding the barnacles. Located above the snail grave yard on the south inside rim of the cone.	16.96168	144.86920	3278	119	
2016-12-09	02:55	In the aft-stbd quarter of the biobox.	16.96173	144.86921	3276	118	
2016-12-09	02:56	Looking for blue mat and that wasn't it.	16.96173	144.86923	3276	114	1481252161973S5K21614.jpg
2016-12-09	02:56	Going over the rim looking for blue mat.	16.96173	144.86925	3274	108	2016-12-09T02_56_19.887276_S5K.jpg
2016-12-09	02:56	Highlights off.	16.96173	144.86928	3276	108	2016-12-09T02_56_39.902710_S5K.jpg
2016-12-09	02:57	Need to go back inside the cone. Turning to port.	16.96172	144.86931	3276	108	
2016-12-09	02:57	Actually turning to stbd.	16.96170	144.86932	3276	130	
2016-12-09	02:57	On top of the rim.	16.96170	144.86934	3277	182	1481252261993S5K21714.jpg
2016-12-09	02:57	Turning back on to the rim.	16.96169	144.86934	3277	199	1481252271056S5K21723.jpg
2016-12-09	02:58	Crest of the rim.	16.96167	144.86930	3276	223	1481252304079S5K21756.jpg
2016-12-09	02:58	Rim crest.	16.96165	144.86928	3276	237	1481252329005S5K21781.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	02:59	Heading west along the rim.	16.96164	144.86921	3276	244	1481252357274S5K21809.jpg
2016-12-09	03:00	Driving the rim of the cone going clockwise.	16.96163	144.86912	3276	267	2016-12-09T03_00_02.908479_S5K.jpg
2016-12-09	03:00	Starting to turn around to the north on the west rim.	16.96162	144.86910	3277	303	1481252435047S5K21887.jpg
2016-12-09	03:00	HD new file started.	16.96163	144.86908	3276	302	1481252449122S5K21901.jpg
2016-12-09	03:01	Turning to stbd.	16.96167	144.86901	3277	325	2016-12-09T03_01_09.913980_S5K.jpg
2016-12-09	03:01	Altered rock.	16.96175	144.86899	3277	10	1481252514940S5K21967.jpg
2016-12-09	03:02	Driving up to the north rim.	16.96178	144.86899	3277	11	1481252549079S5K22001.jpg
2016-12-09	03:02	Some venting almost at the north rim.	16.96185	144.86902	3277	27	1481252579206S5K22031.jpg
2016-12-09	03:03	On the northwest rim with a bit of diffuse venting.	16.96187	144.86902	3276	23	2016-12-09T03_03_28.887932_S5K.jpg
2016-12-09	03:04	Almost at the crest of the north rim.	16.96192	144.86906	3276	60	2016-12-09T03_04_15.894495_S5K.jpg
2016-12-09	03:04	Very altered rocks on the north rim. Squat lobsters.	16.96194	144.86908	3276	82	2016-12-09T03_04_32.911335_S5K.jpg
2016-12-09	03:04	Highlights a few minutes at venting NW rim of cinder cone. 03:02- 03:04	16.96194	144.86908	3276	84	2016-12-09T03_04_33.901412_S5K.jpg
2016-12-09	03:05	More squat lobsters and another white patch and there is Mkr-171.	16.96194	144.86910	3276	117	2016-12-09T03_05_17.897750_S5K.jpg
2016-12-09	03:05	Mkr-171. We have come full circle.	16.96190	144.86913	3276	118	2016-12-09T03_05_39.914464_S5K.jpg
2016-12-09	03:05	Mkr-171	16.96186	144.86916	3275	119	1481252761118S5K22213.jpg
2016-12-09	03:06	Done the whole circle.	16.96186	144.86918	3277	117	2016-12-09T03_06_16.901719_S5K.jpg
2016-12-09	03:06	Highlights on, marker 171 flyover.	16.96186	144.86918	3277	117	1481252781088S5K22233.jpg
2016-12-09	03:07	Done at the cone for today.	16.96186	144.86923	3276	138	2016-12-09T03_07_05.912988_S5K.jpg
2016-12-09	03:08	Highlights off.	16.96186	144.86925	3275	119	2016-12-09T03_08_06.892409_S5K.jpg
2016-12-09	03:08	Moved out over the cone to the west.	16.96186	144.86925	3276	115	
2016-12-09	03:08	Looking for a volcanic rock that wasn't altered.	16.96186	144.86930	3276	110	
2016-12-09	03:09	Can see the edge of the cone with anemones in the rear camera.	16.96185	144.86934	3279	109	
2016-12-09	03:09	Turning to the north outside of the cone.	16.96188	144.86934	3280	330	2016-12-09T03_09_36.882476_S5K.jpg
2016-12-09	03:09	View of the outside wall of the cone.	16.96190	144.86932	3280	273	1481252997015S5K22449.jpg
2016-12-09	03:10	Looks like a cinder cone slope from this side.	16.96189	144.86933	3282	248	2016-12-09T03_10_33.915572_S5K.jpg
2016-12-09	03:11	Moving backwards coming down the face of the cone's east side.	16.96191	144.86936	3281	251	1481253074234S5K22526.jpg
2016-12-09	03:11	Keep backing up.	16.96192	144.86936	3284	253	2016-12-09T03_11_46.924521_S5K.jpg
2016-12-09	03:12	Turning around to look down the slope of the cone.	16.96195	144.86935	3283	277	2016-12-09T03_12_00.896892_S5K.jpg
2016-12-09	03:13	All the rocks look rusty here.	16.96195	144.86934	3281	259	2016-12-09T03_13_50.903331_S5K.jpg
2016-12-09	03:14	Going to try to grab a rusty, fist-sized rock.	16.96196	144.86934	3282	245	
2016-12-09	03:14	We are at the NE portion on the outside of this cone.	16.96197	144.86934	3284	230	2016-12-09T03_14_46.919200_S5K.jpg
2016-12-09	03:17	S42-Geo-13 Piece of altered rock from the outside of the cone on the NE side. About fist-sized put in the aft-port quarter of the forward biobox.	16.96197	144.86935	3285	227	2016-12-09T03_17_20.937736_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	03:18	Going to drive west and look for another rock beyond the cone.	16.96197	144.86935	3285	229	1481253529080S5K22981.jpg
2016-12-09	03:19	Going up and over the cone as we continue driving west.	16.96194	144.86929	3280	224	2016-12-09T03_19_35.923106_S5K.jpg
2016-12-09	03:19	Rim.	16.96192	144.86926	3278	226	1481253592993S5K23045.jpg
2016-12-09	03:20	Inside of the cone.	16.96190	144.86923	3275	225	2016-12-09T03_20_12.920186_S5K.jpg
2016-12-09	03:20	Flying over the cone.	16.96187	144.86919	3275	224	
2016-12-09	03:22	Still inside the cone.	16.96172	144.86895	3278	223	2016-12-09T03_22_50.905886_S5K.jpg
2016-12-09	03:23	Coming over the west rim now.	16.96171	144.86893	3277	222	2016-12-09T03_23_08.900447_S5K.jpg
2016-12-09	03:23	Coming out and over the cone now.	16.96168	144.86890	3276	220	1481253809260S5K23261.jpg
2016-12-09	03:24	Moving west to Sequoia (old waypoint #2).	16.96159	144.86885	3280	221	
2016-12-09	03:24	Sheet flow.	16.96153	144.86880	3283	220	1481253880176S5K23332.jpg
2016-12-09	03:24	Very flat flow.	16.96153	144.86879	3284	220	2016-12-09T03_24_55.925649_S5K.jpg
2016-12-09	03:25	Some broken slabs that would be easier to sample.	16.96151	144.86878	3284	220	2016-12-09T03_25_07.935540_S5K.jpg
2016-12-09	03:25	Layers.	16.96148	144.86875	3284	225	2016-12-09T03_25_31.923137_S5K.jpg
2016-12-09	03:26	Probably a drain-out feature.	16.96148	144.86875	3284	224	1481253977316S5K23429.jpg
2016-12-09	03:27	Unusual to see sheet flows and the rest of the back-arc is pillow lava. Much more fluid flow.	16.96148	144.86874	3285	224	2016-12-09T03_27_17.934574_S5K.jpg
2016-12-09	03:28	Settling here to try and grab a loose piece of lava.	16.96147	144.86871	3285	223	1481254088166S5K23540.jpg
2016-12-09	03:31	S42-Geo-14 Small piece in port-forward quarter of small biobox. Need to get another piece.	16.96148	144.86873	3285	222	
2016-12-09	03:35	Highlights off.	16.96144	144.86877	3285	222	1481254533209S5K23985.jpg
2016-12-09	03:35	Moving to Sequoia and should arrive in about 15 minutes. Ship is already moving in that direction.	16.96145	144.86877	3285	222	
2016-12-09	03:41	About 50 m away.	16.96110	144.86740	3282	267	1481254883214S5K24335.jpg
2016-12-09	03:42	More squat lobsters in the distance.	16.96111	144.86721	3282	247	2016-12-09T03_42_25.930098_S5K.jpg
2016-12-09	03:43	Can see the bottom of Sequoia.	16.96115	144.86716	3273	262	2016-12-09T03_43_40.938113_S5K.jpg
2016-12-09	03:43	Highlights on, approach Sequoia.	16.96115	144.86715	3272	262	1481255037943S5K24490.jpg
2016-12-09	03:44	That was hyper-speed to Sequoia.	16.96115	144.86715	3272	262	1481255044325S5K24496.jpg
2016-12-09	03:44	Sonar image of Sequoia is impressive.	16.96117	144.86711	3272	255	1481255073247S5K24525.jpg
2016-12-09	03:44	Letting the tether settle between ROV and ship.	16.96118	144.86710	3273	250	
2016-12-09	03:45	Black smoker framed in the center of this view.	16.96117	144.86707	3273	249	2016-12-09T03_45_28.953256_S5K.jpg
2016-12-09	03:46	Looking at the east side of Sequoia.	16.96119	144.86706	3273	234	2016-12-09T03_46_01.954145_S5K.jpg
2016-12-09	03:46	Moving around to the north side.	16.96120	144.86704	3272	221	1481255186110S5K24638.jpg
2016-12-09	03:47	Gold colored chimneys are no longer active.	16.96121	144.86701	3272	191	2016-12-09T03_47_00.949470_S5K.jpg
2016-12-09	03:47	Looking south at the north side.	16.96120	144.86697	3270	161	2016-12-09T03_47_47.924360_S5K.jpg
2016-12-09	03:48	Not even half-way up this enormous chimney.	16.96120	144.86697	3270	164	2016-12-09T03_48_04.941183_S5K.jpg
2016-12-09	03:48	Moving up.	16.96120	144.86697	3269	165	1481255303109S5K24755.jpg
2016-12-09	03:48	Burls like a sequoia tree.	16.96120	144.86697	3268	163	2016-12-09T03_48_34.935238_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	03:49	Puffs of black smoke.	16.96121	144.86697	3265	162	
2016-12-09	03:50	3m from the chimney face.	16.96119	144.86697	3264	165	2016-12-09T03_50_01.926213_S5K.jpg
2016-12-09	03:50	Looking for a place to park the vehicle and sample.	16.96119	144.86697	3263	164	2016-12-09T03_50_35.928361_S5K.jpg
2016-12-09	03:52	Moving around to the east side again looking for a sampling spot to park.	16.96119	144.86702	3260	215	2016-12-09T03_52_18.925463_S5K.jpg
2016-12-09	03:53	Highlights off, finding a place to stop and sample.	16.96117	144.86702	3260	219	2016-12-09T03_53_18.965698_S5K.jpg
2016-12-09	03:55	Parking spot?	16.96117	144.86701	3260	218	2016-12-09T03_55_12.939458_S5K.jpg
2016-12-09	03:55	Parking spot?	16.96117	144.86701	3260	218	2016-12-09T03_55_12.939458_S5K.jpg
2016-12-09	03:55	Looking to wedge into the v-shape.	16.96116	144.86701	3260	220	2016-12-09T03_55_29.958851_S5K.jpg
2016-12-09	03:56	Chimlet on the basket.	16.96116	144.86701	3261	220	1481255794393S5K25246.jpg
2016-12-09	03:57	Going to try to sample to the right.	16.96116	144.86700	3261	220	2016-12-09T03_57_27.936943_S5K.jpg
2016-12-09	03:58	Going to retrieve the HFS wand.	16.96116	144.86700	3261	220	2016-12-09T03_58_52.948889_S5K.jpg
2016-12-09	04:00	Out of the holster.	16.96116	144.86700	3261	220	1481256014180S5K25466.jpg
2016-12-09	04:04	120....130....140...going up.	16.96115	144.86700	3261	220	2016-12-09T04_04_18.932555_S5K.jpg
2016-12-09	04:05	HD new file started.	16.96115	144.86700	3261	220	2016-12-09T04_05_04.946482_S5K.jpg
2016-12-09	04:06	Up to 196deg...	16.96115	144.86700	3261	219	2016-12-09T04_06_35.945977_S5K.jpg
2016-12-09	04:09	S42-HFS-15 Start 04:09 On the NE side of Sequoia at 25m altitude (about 6m from the top). Unfiltered Piston #2 In the black smoke after breaking off about an inch of this chimney.	16.96116	144.86699	3261	219	1481256577254S5K26029.jpg
2016-12-09	04:12	Stop. Tmax=274.6 Tavg=261 vol=603 T2=63.	16.96116	144.86699	3261	219	2016-12-09T04_12_51.946762_S5K.jpg
2016-12-09	04:15	S42-HFS-16 Start or:15 Filtered Piston #5. Same location as HFS-15 and looks like tip has not moved.	16.96115	144.86699	3261	219	1481256912244S5K26364.jpg
2016-12-09	04:16	Closeup of the shrimp on the chimney.	16.96115	144.86699	3261	219	2016-12-09T04_16_33.943187_S5K.jpg
2016-12-09	04:20	Highlights on	16.96116	144.86700	3261	219	1481257250096S5K26702.jpg
2016-12-09	04:21	Stop. Tmax=209.9 Tavg=163 vol=640 T2=30.	16.96116	144.86700	3261	219	
2016-12-09	04:21	Temperature dropped quite a bit so need to reposition the wand.	16.96116	144.86700	3261	219	2016-12-09T04_21_33.938952_S5K.jpg
2016-12-09	04:22	The wand was out of the hole.	16.96116	144.86700	3261	219	2016-12-09T04_22_28.952516_S5K.jpg
2016-12-09	04:22	Highlights off	16.96116	144.86700	3261	219	2016-12-09T04_22_35.923897_S5K.jpg
2016-12-09	04:23	Need to get the suction hose out of the view.	16.96116	144.86701	3261	219	2016-12-09T04_23_47.929033_S5K.jpg
2016-12-09	04:24	Using the wand to move the suction hose.	16.96116	144.86700	3261	219	1481257487217S5K26939.jpg
2016-12-09	04:25	Better view!	16.96116	144.86700	3261	219	1481257530937S5K26983.jpg
2016-12-09	04:30	Basket moved and hose is back in the view.	16.96116	144.86700	3261	218	1481257848195S5K27300.jpg
2016-12-09	04:38	S42-HFS-17 Start 04:38 Unfiltered Piston #8 Same exact location with slight movement to get the hottest water.	16.96115	144.86700	3261	219	2016-12-09T04_38_55.943271_S5K.jpg
2016-12-09	04:42	Stop. Tmax=271.5 Tavg=256.9 vol=650 T2=63.	16.96115	144.86700	3261	219	1481258530023S5K27982.jpg
2016-12-09	04:43	Still pumping black smoke.	16.96115	144.86700	3261	218	

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	04:44	Going up...284...going to have to take another sample.	16.96115	144.86700	3261	218	1481258647248S5K28099.jpg
2016-12-09	04:45	S42-HFS-18. Start 04:45 Unfiltered Piston #6 Same exact location with a bit higher temperature.	16.96115	144.86700	3261	218	2016-12-09T04_45_28.968238_S5K.jpg
2016-12-09	04:46	Ship motion looks like it made it down the cable after about 45 seconds.	16.96115	144.86701	3261	218	1481258803436S5K28255.jpg
2016-12-09	04:47	Paused sample when temp went down to 250.	16.96115	144.86700	3261	218	
2016-12-09	04:48	Turning pump back on at 314deg.	16.96115	144.86701	3261	218	
2016-12-09	04:50	Stop. Tmax=338.4 Tavg=332 vol=790 T2=78.	16.96115	144.86700	3261	218	
2016-12-09	04:51	S42-HFS-19 Start 04:51. Unfiltered Piston #4. Same exact location.	16.96115	144.86700	3261	218	2016-12-09T04_51_48.948333_S5K.jpg
2016-12-09	04:53	Pilot had jammed the probe blindly down when these hot temperatures were made. Can't see in the camera exactly where the tip is.	16.96115	144.86700	3261	218	2016-12-09T04_53_12.965624_S5K.jpg
2016-12-09	04:55	Paralvinella worms.	16.96115	144.86700	3261	218	1481259340164S5K28792.jpg
2016-12-09	04:55	Highlights on.	16.96115	144.86701	3261	218	2016-12-09T04_55_53.984646_S5K.jpg
2016-12-09	04:56	Stop. Tmax=345.9 Tavg=343 vol=650 T2=79.	16.96115	144.86701	3261	218	
2016-12-09	04:57	Want a chimney sample and gas tight.	16.96115	144.86701	3261	218	2016-12-09T04_57_32.976917_S5K.jpg
2016-12-09	04:58	Just a bit a chalcopyrite on the HFS tip. Metal sulfide materials from the vent.	16.96115	144.86701	3261	218	2016-12-09T04_58_54.974222_S5K.jpg
2016-12-09	04:59	Still pumping to cool the system out.	16.96115	144.86701	3261	218	2016-12-09T04_59_42.961061_S5K.jpg
2016-12-09	05:00	Going to try to get the one that fell on the biobox.	16.96115	144.86701	3261	218	2016-12-09T05_00_49.963707_S5K.jpg
2016-12-09	05:02	Sample?	16.96115	144.86701	3261	218	2016-12-09T05_02_37.962847_S5K.jpg
2016-12-09	05:05	S42-Geo-20 Chimney from Sequoia that was knocked down when trying to get the other chimney that fell on top of the biobox. ROV in same location as the previous HFS samples.	16.96115	144.86701	3261	218	1481259904215S5K29356.jpg
2016-12-09	05:05	Highlights off. HD file change.	16.96115	144.86701	3261	218	2016-12-09T05_05_08.985204_S5K.jpg
2016-12-09	05:06	Second piece of the chimney that broke.	16.96115	144.86701	3261	218	
2016-12-09	05:07	Second piece successfully put in the aft biobox with the first piece.	16.96115	144.86701	3261	218	
2016-12-09	05:07	When biobox lid opened the skinny chimney slid between the fore and aft bioboxes. It probably won't be there upon ascent but could be.	16.96115	144.86701	3261	218	2016-12-09T05_07_50.983705_S5K.jpg
2016-12-09	05:08	Pieces of chimney fell all over the sled.	16.96115	144.86701	3261	218	2016-12-09T05_08_28.000076_S5K.jpg
2016-12-09	05:09	Looking for an actively forming chimney.	16.96115	144.86701	3261	218	2016-12-09T05_09_14.984710_S5K.jpg
2016-12-09	05:10	Will have to reposition to take the gas tight in the same chimney where the HFS samples were taken.	16.96116	144.86701	3261	218	2016-12-09T05_10_27.976897_S5K.jpg
2016-12-09	05:11	Stowing the HFS wand.	16.96116	144.86701	3261	218	2016-12-09T05_11_02.985222_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	05:11	Picture of broken chimney pieces on the sled.	16.96116	144.86701	3261	218	1481260314352S5K29766.jpg
2016-12-09	05:13	Going to try to take the skinny-darker chimney after stowing HFS wand.	16.96115	144.86701	3261	218	1481260426057S5K29878.jpg
2016-12-09	05:17	Putting the wand into the plastic frame around the wand to hold it for now.	16.96115	144.86701	3261	218	2016-12-09T05_17_10.984689_S5K.jpg
2016-12-09	05:19	Trying to get a small chimney.	16.96115	144.86701	3261	218	1481260748112S5K30200.jpg
2016-12-09	05:21	Been at this same parking spot doing sampling. Looking at the NE side of the chimney at 3261m depth and 26.4 m above the bottom (6 meters from the top of the chimney).	16.96115	144.86701	3261	218	1481260887121S5K30339.jpg
2016-12-09	05:22	That is our smoker.	16.96116	144.86700	3261	211	2016-12-09T05_22_27.999147_S5K.jpg
2016-12-09	05:23	Going to go to the base of the chimney and grab the gas tight bottle securely before trying to sample.	16.96117	144.86700	3261	196	2016-12-09T05_23_10.973901_S5K.jpg
2016-12-09	05:24	Extension below us so need to go out and down the chimney.	16.96118	144.86700	3269	199	1481261055319S5K30507.jpg
2016-12-09	05:24	Put HFS wand in its own holster on the drive down the chimney.	16.96120	144.86701	3264	197	2016-12-09T05_24_43.998447_S5K.jpg
2016-12-09	05:26	Chimney base covered in squat lobsters.	16.96123	144.86701	3276	192	2016-12-09T05_26_04.979878_S5K.jpg
2016-12-09	05:26	Need to move ship 20m north.	16.96120	144.86701	3275	192	
2016-12-09	05:26	Removing bungees from gas tight bottles.	16.96120	144.86704	3276	202	2016-12-09T05_26_50.991314_S5K.jpg
2016-12-09	05:28	Sulfide debris at the base.	16.96115	144.86706	3283	232	2016-12-09T05_28_15.979639_S5K.jpg
2016-12-09	05:29	This is the yellow-green gastight bottle #12 out of the basket.	16.96106	144.86707	3284	230	1481261386007S5K30838.jpg
2016-12-09	05:30	Positioning the bottle in the grip for sampling.	16.96112	144.86708	3283	229	2016-12-09T05_30_41.992569_S5K.jpg
2016-12-09	05:32	Going back up to sample.	16.96120	144.86708	3280	226	
2016-12-09	05:36	Sea cucumber.	16.96116	144.86704	3262	222	2016-12-09T05_36_05.011345_S5K.jpg
2016-12-09	05:36	Highlights. One minute video of sea pig/cucumber floating by.	16.96118	144.86703	3262	203	2016-12-09T05_36_45.984091_S5K.jpg
2016-12-09	05:39	Moving port arm out for sampling.	16.96117	144.86698	3261	158	1481261975178S5K31427.jpg
2016-12-09	05:43	Slight bump against the chimney.	16.96116	144.86697	3261	154	2016-12-09T05_43_53.021627_S5K.jpg
2016-12-09	05:46	Trying to wedge the right-front corner of the basket under the white ledge for stability.	16.96116	144.86696	3261	135	2016-12-09T05_46_36.010757_S5K.jpg
2016-12-09	05:49	Coming in like a 700lb hummingbird!	16.96116	144.86696	3261	136	1481262555306S5K32007.jpg
2016-12-09	05:52	Parked! Need some smoke to clear.	16.96115	144.86696	3261	136	2016-12-09T05_52_44.012519_S5K.jpg
2016-12-09	05:54	Moved the porch in.	16.96115	144.86696	3261	135	1481262848207S5K32300.jpg
2016-12-09	05:54	Here comes the gastight.	16.96115	144.86696	3261	135	1481262884361S5K32336.jpg
2016-12-09	05:55	Ram is aligned.	16.96115	144.86696	3261	136	2016-12-09T05_55_01.020961_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	05:58	S42-GTB-21 Fired when saw deflection in the black smoke. Tip moved when the ram was fired (moved away from orifice when it was fired). Same orifice as sampled with HFS.	16.96116	144.86696	3261	134	2016-12-09T05_58_59.019020_S5K.jpg
2016-12-09	06:00	That was Yellow-green GTB #12.	16.96116	144.86696	3261	134	2016-12-09T06_00_44.027670_S5K.jpg
2016-12-09	06:01	While here will try to take a chimney sample as well.	16.96116	144.86696	3261	134	
2016-12-09	06:03	Potential that the other gastight bottle was fired when bumped the chimney.	16.96116	144.86697	3261	134	2016-12-09T06_03_19.018430_S5K.jpg
2016-12-09	06:05	Looking for a chimney sample nearby.	16.96117	144.86697	3261	136	1481263537284S5K32989.jpg
2016-12-09	06:06	Trying to find a chimney to sample while flying.	16.96118	144.86698	3261	164	1481263585280S5K33037.jpg
2016-12-09	06:12	First attempt broke off the chimney but could not keep it without breaking.	16.96119	144.86700	3260	177	1481263938427S5K33390.jpg
2016-12-09	06:13	Can see broken piece resting on the ledge.	16.96118	144.86699	3260	179	2016-12-09T06_13_07.041269_S5K.jpg
2016-12-09	06:14	Couldn't get that piece as it was too brittle.	16.96118	144.86699	3260	177	
2016-12-09	06:16	Little beehive is venting.	16.96118	144.86702	3260	202	1481264164171S5K33616.jpg
2016-12-09	06:17	Going to try for the beehive.	16.96117	144.86701	3261	202	1481264269316S5K33721.jpg
2016-12-09	06:18	Shrimp were disturbed by that chimney coming off.	16.96118	144.86702	3261	202	
2016-12-09	06:19	Going to the bottom to put the gas tight in the basket.	16.96118	144.86703	3261	203	2016-12-09T06_19_01.026427_S5K.jpg
2016-12-09	06:22	On the bottom to stow the bottle.	16.96125	144.86704	3279	210	2016-12-09T06_22_02.043125_S5K.jpg
2016-12-09	06:22	Looked at the o-ring on the yellow-green gas tight.	16.96126	144.86703	3279	210	2016-12-09T06_22_59.033591_S5K.jpg
2016-12-09	06:24	Putting the gas tight back in the cradle.	16.96125	144.86703	3279	210	2016-12-09T06_24_18.050503_S5K.jpg
2016-12-09	06:25	Looking at the other gas-tight to check the o-ring but can't get a good look.	16.96125	144.86703	3279	209	2016-12-09T06_25_49.036428_S5K.jpg
2016-12-09	06:28	Getting the gas-tight cradle bungee out to secure the bottles.	16.96123	144.86705	3279	204	2016-12-09T06_28_52.032993_S5K.jpg
2016-12-09	06:34	Gas-tights are secure?	16.96123	144.86706	3279	204	
2016-12-09	06:36	Trying to get the chimney piece on the basket. Can't get it as it is disintegrating.	16.96127	144.86708	3279	204	
2016-12-09	06:36	HD new file started.	16.96127	144.86707	3279	204	1481265366264S5K34818.jpg
2016-12-09	06:37	Next will try to get a piece of this sulfide at the base of the chimney.	16.96126	144.86704	3279	204	1481265477080S5K34929.jpg
2016-12-09	06:38	Scaleworm disappeared.	16.96126	144.86703	3279	203	2016-12-09T06_38_41.063154_S5K.jpg
2016-12-09	06:39	Hunting for a piece sulfide.	16.96124	144.86700	3279	203	2016-12-09T06_39_40.056366_S5K.jpg
2016-12-09	06:42	S42-Geo-22 Piece of sulfide from base of Sequoia. Going in aft-stbd large biobox.	16.96123	144.86706	3279	198	2016-12-09T06_42_18.075084_S5K.jpg
2016-12-09	06:43	For remainder of dive would like to do a long excursion to waypoints 7-9 for a look at the area.	16.96125	144.86705	3279	198	2016-12-09T06_43_47.064399_S5K.jpg
2016-12-09	06:45	Moving east to waypoint #8.	16.96123	144.86701	3277	206	1481265930128S5K35382.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	06:47	Rising up as pull away from this site.	16.96116	144.86707	3273	230	1481266031267S5K35483.jpg
2016-12-09	06:48	Looking west.	16.96106	144.86708	3255	277	2016-12-09T06_48_24.055045_S5K.jpg
2016-12-09	06:49	Looking north.	16.96104	144.86695	3254	2	2016-12-09T06_49_33.060807_S5K.jpg
2016-12-09	06:50	On our way east after a few quick video shots.	16.96117	144.86694	3260	118	
2016-12-09	06:51	Bumped the top as we left.	16.96116	144.86706	3271	109	
2016-12-09	06:51	All on the rear view camera.	16.96101	144.86719	3276	129	
2016-12-09	06:52	Transit off the bottom.	16.96107	144.86747	3283	98	
2016-12-09	06:54	Highlights were on for view of Sequoia, 06:47 to 06:50	16.96105	144.86788	3262	95	2016-12-09T06_54_12.035353_S5K.jpg
2016-12-09	06:54	Naming the cone & "Voodoo"; after donuts in Portland.	16.96094	144.86799	3257	93	
2016-12-09	07:00	Waiting for the ship to catch up.	16.96070	144.86875	3168	73	
2016-12-09	07:13	Almost at waypoint #8 and starting to see bottom on the sonar. Been flying high.	16.96114	144.87052	3260	57	
2016-12-09	07:14	Seeing bottom in rear camera.	16.96126	144.87046	3278	77	
2016-12-09	07:15	Back on the bottom and seeing lava.	16.96127	144.87051	3282	65	2016-12-09T07_15_13.065868_S5K.jpg
2016-12-09	07:15	Jumbled flow and still about 50m west of the waypoint.	16.96126	144.87053	3282	83	2016-12-09T07_15_28.043650_S5K.jpg
2016-12-09	07:15	Some venting and biology but not much.	16.96123	144.87060	3280	120	1481267750558S5K37202.jpg
2016-12-09	07:16	Nice chimney ahead.	16.96119	144.87073	3278	100	2016-12-09T07_16_18.062463_S5K.jpg
2016-12-09	07:16	Older spires and some white areas.	16.96120	144.87078	3279	93	2016-12-09T07_16_30.074670_S5K.jpg
2016-12-09	07:17	Taking a look at this chimney.	16.96118	144.87082	3279	99	1481267818279S5K37270.jpg
2016-12-09	07:17	Shimmering but no black smoke.	16.96111	144.87082	3275	60	1481267845483S5K37297.jpg
2016-12-09	07:17	Lots of smoke beyond this chimney looking NE.	16.96111	144.87093	3274	62	2016-12-09T07_17_46.052959_S5K.jpg
2016-12-09	07:18	Highlights survey waypoint 8; new chimney. On at 7:17.	16.96111	144.87086	3275	100	
2016-12-09	07:18	Second chimney right next to this one.	16.96108	144.87086	3276	99	2016-12-09T07_18_18.049890_S5K.jpg
2016-12-09	07:18	Nice old flanges.	16.96103	144.87085	3276	62	2016-12-09T07_18_36.068638_S5K.jpg
2016-12-09	07:19	Shimmer no smoke.	16.96103	144.87089	3277	15	1481267964496S5K37416.jpg
2016-12-09	07:19	Looking right to see if free to swing around.	16.96102	144.87086	3276	66	2016-12-09T07_19_42.071506_S5K.jpg
2016-12-09	07:20	Looking around at the twin chimneys.	16.96099	144.87088	3274	1	2016-12-09T07_20_25.070313_S5K.jpg
2016-12-09	07:21	White snails and no smoke.	16.96104	144.87093	3276	258	1481268076179S5K37528.jpg
2016-12-09	07:22	Smoke was coming from somewhere.	16.96105	144.87087	3271	1	2016-12-09T07_22_39.069271_S5K.jpg
2016-12-09	07:23	Venting at the top but not black smoke.	16.96125	144.87082	3275	146	1481268212188S5K37664.jpg
2016-12-09	07:24	Some smoke.	16.96127	144.87083	3273	158	2016-12-09T07_24_09.064730_S5K.jpg
2016-12-09	07:24	Window in the sulfide.	16.96127	144.87083	3277	165	1481268278071S5K37730.jpg
2016-12-09	07:25	Blue mat?	16.96126	144.87076	3280	153	2016-12-09T07_25_18.078913_S5K.jpg
2016-12-09	07:27	Going to do a quick grab if possible.	16.96120	144.87078	3282	134	2016-12-09T07_27_12.098797_S5K.jpg
2016-12-09	07:27	There is a mussel, shrimp, limpet, anemone and squat lobster.	16.96117	144.87078	3282	134	2016-12-09T07_27_43.093116_S5K.jpg

Date	Time	S42 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	07:28	Trying to take the last sample.	16.96120	144.87075	3282	138	2016-12-09T07_28_45.097506_S5K.jpg
2016-12-09	07:29	Landing for the sample.	16.96116	144.87078	3282	123	2016-12-09T07_29_34.064491_S5K.jpg
2016-12-09	07:32	Highlights off	16.96124	144.87073	3282	118	
2016-12-09	07:35	S43-Geo-23 Blue-colored chimlet from wild-looking chimney upon arriving at Waypoint #8. Top of chimney was venting. Maybe animals on the chimney.	16.96116 559	144.87088	3282	112	2016-12-09T07_35_05.105609_S5K.jpg
2016-12-09	07:37	Off the bottom and coming to the surface.	16.96123	144.87091	3280	220	2016-12-09T07_37_36.058322_S5K.jpg

Table 6.6-9 Dive S43 – Hafa Adai

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	23:10	There is the bottom.	16.96835	144.86499	3273	84	
2016-12-09	23:10	Ropy sheet flow on the west side of the crater rim.	16.96834	144.86499	3279	79	2016-12-09T23_10_50.431917_S5K.jpg
2016-12-09	23:11	Some sediment coating the lava.	16.96833	144.86498	3280	61	2016-12-09T23_11_18.428364_S5K.jpg
2016-12-09	23:11	Backing up a little bit to get the loose pieces seen on the rear camera.	16.96832	144.86496	3279	55	2016-12-09T23_11_50.427070_S5K.jpg
2016-12-09	23:13	Setting up to grab a rock from this small pit.	16.96830	144.86490	3280	153	2016-12-09T23_13_50.445422_S5K.jpg
2016-12-09	23:14	HD video started a few minutes after reaching the bottom.	16.96830	144.86490	3280	152	
2016-12-09	23:14	Nice view of filter feeders on the edge of this small collapse.	16.96829	144.86490	3280	152	S5K09929.jpg
2016-12-09	23:15	Not a big enough piece.	16.96828	144.86490	3280	152	2016-12-09T23_15_42.420947_S5K.jpg
2016-12-09	23:16	Comatulid unstalked crinoids.	16.96828	144.86490	3280	152	S5K09999.jpg
2016-12-09	23:16	Switching arms to sample a rock.	16.96828	144.86491	3280	152	S5K10021.jpg
2016-12-09	23:19	First sample fell out of the grip before placing it in the biobox.	16.96825	144.86481	3280	151	S5K10183.jpg
2016-12-09	23:21	S43-Geo-01 Piece of lava from a collapse feature taken from outside of the cone near waypoint 10. Placed in aft-port quarter of biobox.	16.96820	144.86493	3280	152	1481325669508S5K10309.jpg
2016-12-09	23:22	<i>SuBastian</i> backed up from the landing site to find a loose piece of lava within the jumbled sheet flow outside of the crater.	16.96828	144.86486	3280	152	S5K10410.jpg
2016-12-09	23:24	Collapse pit.	16.96827	144.86484	3279	153	2016-12-09T23_24_29.455636_S5K.jpg
2016-12-09	23:24	HD video which is converted to other format is down. Engineers are working on it.	16.96825	144.86483	3279	123	S5K10521.jpg
2016-12-09	23:26	Very flat and sedimented.	16.96826	144.86490	3277	44	S5K10627.jpg
2016-12-09	23:26	Flat sheet flow.	16.96829	144.86493	3278	44	2016-12-09T23_26_49.457469_S5K.jpg
2016-12-09	23:27	Quite a bit of sediment and filter feeders so flow wasn't recent (100 years ago?).	16.96833	144.86497	3279	44	2016-12-09T23_27_20.468271_S5K.jpg
2016-12-09	23:27	Wall of crater is on sonar ahead of us.	16.96837	144.86501	3279	44	2016-12-09T23_27_55.466217_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	23:29	We are still a bit west of waypoint 10 and the cone.	16.96843	144.86512	3281	43	2016-12-09T23_29_07.473315_S5K.jpg
2016-12-09	23:29	HD converter feed is now on line.	16.96848	144.86518	3281	45	
2016-12-09	23:29	Flat and heavy sediment.	16.96848	144.86520	3281	44	S5K10812.jpg
2016-12-09	23:30	A few dandelions.	16.96849	144.86527	3281	43	2016-12-09T23_30_02.464873_S5K.jpg
2016-12-09	23:31	Jumbled flow here.	16.96851	144.86545	3280	43	2016-12-09T23_31_19.471735_S5K.jpg
2016-12-09	23:31	Brittle stars.	16.96852	144.86550	3279	58	2016-12-09T23_31_31.445963_S5K.jpg
2016-12-09	23:32	Starting to get at the edge of the cone.	16.96850	144.86557	3276	87	S5K10979.jpg
2016-12-09	23:32	Going up the slope.	16.96849	144.86559	3273	88	2016-12-09T23_32_34.438901_S5K.jpg
2016-12-09	23:32	Cone is made of lava.	16.96848	144.86562	3270	89	S5K11007.jpg
2016-12-09	23:33	Climbing up the west wall.	16.96848	144.86570	3263	88	2016-12-09T23_33_31.458780_S5K.jpg
2016-12-09	23:34	Common name of crinoids is &"feather stars";.	16.96847	144.86581	3264	87	
2016-12-09	23:34	Climbing further up the slope.	16.96847	144.86585	3263	87	S5K11130.jpg
2016-12-09	23:35	Chaotic flow.	16.96846	144.86595	3261	87	S5K11169.jpg
2016-12-09	23:36	Approaching the top.	16.96845	144.86601	3258	87	2016-12-09T23_35_59.443485_S5K.jpg
2016-12-09	23:36	Rim?	16.96845	144.86606	3257	87	2016-12-09T23_36_29.434637_S5K.jpg
2016-12-09	23:36	Bathy shows a shear drop-off to the inside of the crater.	16.96844	144.86609	3256	87	1481326613719S5K11253.jpg
2016-12-09	23:37	Not the top yet. Was an optical illusion.	16.96842	144.86613	3255	87	2016-12-09T23_37_11.440836_S5K.jpg
2016-12-09	23:37	Flattened lobes.	16.96841	144.86616	3254	88	2016-12-09T23_37_28.462788_S5K.jpg
2016-12-09	23:37	Crater's edge.	16.96839	144.86624	3253	87	2016-12-09T23_37_59.459436_S5K.jpg
2016-12-09	23:38	Crested the edge and will go over then turn 180deg to see the wall as we descend.	16.96840	144.86629	3251	88	
2016-12-09	23:38	Twirling to port.	16.96837	144.86633	3252	23	2016-12-09T23_38_50.437317_S5K.jpg
2016-12-09	23:39	Last framegrab had a jellyfish.	16.96840	144.86639	3253	261	S5K11428.jpg
2016-12-09	23:40	Coming down the wall of the crater looking at the west wall from the inside of the crater.	16.96839	144.86638	3253	259	2016-12-09T23_40_04.455769_S5K.jpg
2016-12-09	23:40	Solid lava wall.	16.96841	144.86640	3257	258	2016-12-09T23_40_41.456157_S5K.jpg
2016-12-09	23:40	Practically vertical.	16.96841	144.86641	3260	256	2016-12-09T23_40_58.431812_S5K.jpg
2016-12-09	23:41	Not smokey at all so probably no vents.	16.96840	144.86640	3272	263	2016-12-09T23_41_46.448698_S5K.jpg
2016-12-09	23:42	Close to the bottom.	16.96839	144.86641	3273	267	2016-12-09T23_42_06.432058_S5K.jpg
2016-12-09	23:42	Turning around to head out east into the crater. HFS is reading normal background pH.	16.96839	144.86642	3274	270	2016-12-09T23_42_15.444790_S5K.jpg
2016-12-09	23:42	Normal temperatures and no cloudy water.	16.96839	144.86641	3274	329	S5K11597.jpg
2016-12-09	23:42	pH is around 7.5 which is normal.	16.96838	144.86640	3275	25	S5K11614.jpg
2016-12-09	23:43	Heading out the open side of the crater where the lava flowed out.	16.96838	144.86642	3274	74	S5K11676.jpg
2016-12-09	23:44	Puzzling back-arc lava eruption.	16.96838	144.86644	3274	74	S5K11699.jpg
2016-12-09	23:45	Slight rise as we come along the bottom of the crater.	16.96834	144.86654	3273	74	2016-12-09T23_45_10.460113_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	23:45	Over on the south wall so will move over to the center of the crater.	16.96836	144.86660	3271	79	2016-12-09T23_45_34.448203_S5K.jpg
2016-12-09	23:45	Edge of the south crater.	16.96840	144.86661	3269	80	2016-12-09T23_45_59.440091_S5K.jpg
2016-12-09	23:46	That is the south wall of the crater.	16.96841	144.86664	3266	89	2016-12-09T23_46_27.462321_S5K.jpg
2016-12-09	23:46	Paused while waiting for the ship to start moving.	16.96837	144.86633	3265	95	2016-12-09T23_46_44.453460_S5K.jpg
2016-12-09	23:47	Turning a bit more into the center of the crater.	16.96831	144.86635	3253	88	2016-12-09T23_47_47.440447_S5K.jpg
2016-12-09	23:48	Coming over a bit of a saddle.	16.96833	144.86639	3253	91	1481327288634S5K11928.jpg
2016-12-09	23:48	We are probably in the southern half of the channel flowing west out of the crater.	16.96839	144.86674	3249	60	2016-12-09T23_48_52.443848_S5K.jpg
2016-12-09	23:49	Spinning to look north across the crater.	16.96845	144.86680	3246	12	2016-12-09T23_49_15.462121_S5K.jpg
2016-12-09	23:50	Coming back down after moving a bit north.	16.96856	144.86681	3253	24	2016-12-09T23_50_02.438301_S5K.jpg
2016-12-09	23:51	Sonar showing a channel between outcrops.	16.96859	144.86686	3255	50	2016-12-09T23_51_06.435388_S5K.jpg
2016-12-09	23:52	Coming down to the bottom after the dropoff.	16.96869	144.86707	3262	61	
2016-12-09	23:53	Chaotic flow out of the channel.	16.96881	144.86720	3268	83	2016-12-09T23_53_13.454382_S5K.jpg
2016-12-09	23:54	Seafloor gradually rising with more intact flows.	16.96892	144.86742	3266	85	2016-12-09T23_54_11.453744_S5K.jpg
2016-12-09	23:56	Turning south out of the channel of the caldera's flow.	16.96909	144.86789	3266	103	2016-12-09T23_55_59.454347_S5K.jpg
2016-12-09	23:57	Doing a spin to take a wrap out of the tether.	16.96908	144.86805	3268	57	
2016-12-09	23:57	Did a 360 and stopped.	16.96906	144.86804	3267	200	2016-12-09T23_57_43.462254_S5K.jpg
2016-12-09	23:58	Waiting for the ship to head south.	16.96904	144.86783	3266	223	2016-12-09T23_58_13.465460_S5K.jpg
2016-12-09	23:58	Star shape in the lava.	16.96903	144.86783	3267	228	2016-12-09T23_58_37.452279_S5K.jpg
2016-12-09	23:59	Glass sponge.	16.96900	144.86779	3269	214	2016-12-09T23_59_50.447056_S5K.jpg
2016-12-09	23:59	Stalked crinoid?	16.96900	144.86779	3269	213	S5K12633.jpg
2016-12-10	00:02	Stalked coral on the left and glass sponge on the right.	16.96903	144.86784	3269	213	S5K12808.jpg
2016-12-10	00:03	Closeup of the stalked coral.	16.96903	144.86787	3269	213	2016-12-10T00_03_23.425127_S5K.jpg
2016-12-10	00:03	Still waiting for the ship.	16.96902	144.86789	3269	213	2016-12-10T00_03_53.453738_S5K.jpg
2016-12-10	00:04	Starting to move to the southwest to Waypoint #13 after turning out of the channel flow at Waypoint #12.	16.96902	144.86789	3269	214	2016-12-10T00_04_58.447466_S5K.jpg
2016-12-10	00:07	Rough lava not for hiking.	16.96894	144.86773	3265	226	2016-12-10T00_07_10.448727_S5K.jpg
2016-12-10	00:08	There are the lasers that are 10cm apart.	16.96851	144.86755	3268	188	2016-12-10T00_08_53.460625_S5K.jpg
2016-12-10	00:09	Skirting the south side of the cone.	16.96843	144.86747	3265	209	S5K13215.jpg
2016-12-10	00:11	Stretched out on the tether.	16.96819	144.86743	3268	207	2016-12-10T00_11_06.456065_S5K.jpg
2016-12-10	00:11	Waiting for the ship to catch up.	16.96814	144.86740	3270	208	2016-12-10T00_11_24.445187_S5K.jpg
2016-12-10	00:12	Laser view of sponge.	16.96812	144.86746	3267	207	2016-12-10T00_12_51.463238_S5K.jpg
2016-12-10	00:13	Water comes out of the center of the sponge.	16.96815	144.86744	3266	206	2016-12-10T00_13_24.468435_S5K.jpg
2016-12-10	00:16	Could it be a brittle star on the sponge?	16.96815	144.86743	3272	199	S5K13614.jpg
2016-12-10	00:16	Ship has caught up so off we go.	16.96815	144.86743	3272	199	2016-12-10T00_16_27.453593_S5K.jpg
2016-12-10	00:17	Still skirting the south side of the cone.	16.96811	144.86737	3269	196	2016-12-10T00_17_08.454595_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	00:21	Getting close to the waypoint. The lava is smoother here.	16.96762	144.86716	3273	203	S5K13924.jpg
2016-12-10	00:22	Smooth pillow lobes.	16.96754	144.86714	3274	203	S5K13973.jpg
2016-12-10	00:22	Turning a bit more due south to check out a few cones.	16.96752	144.86713	3275	203	S5K13991.jpg
2016-12-10	00:23	Lavas are changing to a bit more jumbled and less smooth.	16.96748	144.86711	3276	203	S5K14029.jpg
2016-12-10	00:23	Moving over to the west to clear the ship and zone of safety.	16.96745	144.86711	3277	202	S5K14064.jpg
2016-12-10	00:24	Scanning to stbd at the waypoint.	16.96743	144.86710	3275	262	2016-12-10T00_24_22.460180_S5K.jpg
2016-12-10	00:25	Looking a bit north of due west.	16.96746	144.86701	3277	284	2016-12-10T00_25_27.468522_S5K.jpg
2016-12-10	00:26	This might be the rim of the tiny crater on the bathymetry.	16.96746	144.86694	3276	285	2016-12-10T00_26_08.479675_S5K.jpg
2016-12-10	00:26	Still approaching the small crater according to the sonar.	16.96753	144.86691	3274	278	2016-12-10T00_26_54.483659_S5K.jpg
2016-12-10	00:27	Pillow tubes coming down from the crater.	16.96755	144.86683	3274	262	2016-12-10T00_27_47.470313_S5K.jpg
2016-12-10	00:28	Edge of crater.	16.96754	144.86680	3273	261	2016-12-10T00_28_02.483664_S5K.jpg
2016-12-10	00:28	Looking down in the crater.	16.96752	144.86678	3272	252	2016-12-10T00_28_24.471562_S5K.jpg
2016-12-10	00:28	Sonar trace of the crater is great.	16.96750	144.86676	3272	233	S5K14366.jpg
2016-12-10	00:29	Shaft down into the crater.	16.96749	144.86672	3273	222	2016-12-10T00_29_14.463015_S5K.jpg
2016-12-10	00:29	Little staining.	16.96747	144.86671	3273	210	2016-12-10T00_29_33.487236_S5K.jpg
2016-12-10	00:30	Closeup of staining and no venting.	16.96744	144.86669	3273	183	2016-12-10T00_30_18.473078_S5K.jpg
2016-12-10	00:31	Going to head 140 toward the south.	16.96747	144.86669	3268	176	
2016-12-10	00:32	No evidence of venting on the sensors.	16.96740	144.86678	3270	139	
2016-12-10	00:33	Lots of little craters on the flanks of this cone.	16.96732	144.86687	3273	139	2016-12-10T00_33_22.476136_S5K.jpg
2016-12-10	00:34	Water may be a bit smokey but no animal evidence.	16.96716	144.86697	3271	138	2016-12-10T00_34_33.484958_S5K.jpg
2016-12-10	00:35	Another crater.	16.96706	144.86700	3269	139	S5K14769.jpg
2016-12-10	00:37	Heading due south.	16.96694	144.86722	3269	179	1481330228568S5K14868.jpg
2016-12-10	00:38	Coming over into another pit.	16.96675	144.86722	3272	181	
2016-12-10	00:40	No evidence of venting.	16.96656	144.86722	3278	181	S5K15045.jpg
2016-12-10	00:42	Heading due south still to waypoint #14.	16.96626	144.86736	3274	181	S5K15182.jpg
2016-12-10	00:44	Massive pillow lava with sediment.	16.96581	144.86733	3276	179	S5K15320.jpg
2016-12-10	00:45	Small ridge of massive pillow.	16.96583	144.86734	3276	160	S5K15390.jpg
2016-12-10	00:46	Small pit.	16.96581	144.86734	3277	170	2016-12-10T00_46_12.487745_S5K.jpg
2016-12-10	00:47	Still moving south through lava flows. A lot of massive pillows with some broken pieces.	16.96554	144.86734	3275	182	2016-12-10T00_47_37.508547_S5K.jpg
2016-12-10	00:48	Edge of a collapse or small fissure.	16.96553	144.86744	3275	182	2016-12-10T00_48_13.509204_S5K.jpg
2016-12-10	00:49	Coming over a ridge and collapse.	16.96529	144.86745	3276	180	
2016-12-10	00:50	In a flat channel with sheet flow.	16.96518	144.86742	3277	182	S5K15644.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	00:50	May be some sulfides on the surface of the sheet flow.	16.96527	144.86724	3280	182	2016-12-10T00_50_36.482059_S5K.jpg
2016-12-10	00:51	Small chimneys.	16.96526	144.86717	3281	181	
2016-12-10	00:51	Small line of tiny chimneys.	16.96530	144.86714	3281	177	2016-12-10T00_51_42.481497_S5K.jpg
2016-12-10	00:51	Chimneys but inactive.	16.96530	144.86714	3281	183	2016-12-10T00_51_55.497531_S5K.jpg
2016-12-10	00:52	Old venting.	16.96535	144.86717	3281	210	2016-12-10T00_52_48.485025_S5K.jpg
2016-12-10	00:53	No animals or any evidence of venting. Oxidized chimneys.	16.96539	144.86712	3282	184	S5K15845.jpg
2016-12-10	00:54	Will test a chimney to see how oxidized it is inside.	16.96537	144.86708	3284	178	2016-12-10T00_54_46.504975_S5K.jpg
2016-12-10	00:56	Shrimp behind.	16.96538	144.86707	3285	203	S5K16018.jpg
2016-12-10	00:57	Fell over.	16.96536	144.86710	3285	199	S5K16090.jpg
2016-12-10	00:59	Trying for another one.	16.96535	144.86713	3285	195	2016-12-10T00_59_12.500925_S5K.jpg
2016-12-10	01:00	Got a little piece of it.	16.96533	144.86713	3284	181	2016-12-10T01_00_42.494688_S5K.jpg
2016-12-10	01:01	Aft starboard of front biobox.	16.96533	144.86711	3285	181	1481331675736S5K16315.jpg
2016-12-10	01:01	S43-Geo-02 Piece of old altered chimney due S of the cone. South of WP 14. In sheet flows.	16.96533	144.86710	3285	183	S5K16339.jpg
2016-12-10	01:03	Shift change for the ROV crew.	16.96535	144.86710	3281	180	2016-12-10T01_03_52.505974_S5K.jpg
2016-12-10	01:05	In the channel of flat sheet flow as we head south.	16.96515	144.86710	3282	170	2016-12-10T01_05_47.496052_S5K.jpg
2016-12-10	01:06	Occasional hydrothermal deposits.	16.96493	144.86717	3281	162	1481331985982S5K16625.jpg
2016-12-10	01:06	Zooming quickly south.	16.96483	144.86720	3280	158	2016-12-10T01_06_45.519747_S5K.jpg
2016-12-10	01:07	Flat.	16.96458	144.86733	3282	152	2016-12-10T01_07_22.489753_S5K.jpg
2016-12-10	01:10	Heading for Alba Vent to the south but following sheet flow channel.	16.96406	144.86757	3280	171	S5K16873.jpg
2016-12-10	01:11	Bit of some relief.	16.96392	144.86758	3279	171	2016-12-10T01_11_01.502457_S5K.jpg
2016-12-10	01:12	Waiting a bit for the ship.	16.96380	144.86757	3280	170	2016-12-10T01_12_49.514615_S5K.jpg
2016-12-10	01:15	Continuing south.	16.96377	144.86758	3281	171	S5K17170.jpg
2016-12-10	01:15	Small hydrothermal deposit.	16.96373	144.86758	3281	171	2016-12-10T01_15_42.520600_S5K.jpg
2016-12-10	01:16	Moving out of channel into rougher flow.	16.96358	144.86760	3281	170	2016-12-10T01_16_19.495758_S5K.jpg
2016-12-10	01:18	Bottom got away from us.	16.96325	144.86763	3273	171	2016-12-10T01_18_04.491766_S5K.jpg
2016-12-10	01:18	10m off.	16.96319	144.86764	3274	170	S5K17343.jpg
2016-12-10	01:18	Back on the bottom.	16.96311	144.86766	3280	171	2016-12-10T01_18_52.510048_S5K.jpg
2016-12-10	01:19	That was a fish but no focus. Getting yanked by the tether.	16.96303	144.86767	3277	170	S5K17393.jpg
2016-12-10	01:20	Doing some ship and tether management.	16.96278	144.86775	3267	155	
2016-12-10	01:22	Back near the bottom.	16.96257	144.86761	3277	196	2016-12-10T01_22_43.508430_S5K.jpg
2016-12-10	01:24	About 140m from Alba.	16.96239	144.86760	3276	165	1481333039550S5K17679.jpg
2016-12-10	01:24	Fish.	16.96227	144.86764	3278	172	S5K17727.jpg
2016-12-10	01:26	Looks like some flat flows. Seeing squat lobsters.	16.96207	144.86760	3280	185	S5K17853.jpg
2016-12-10	01:27	A bit of staining and flatter sheet flows.	16.96204	144.86758	3281	183	S5K17883.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	01:28	Ship is yanking our tether so not many good photos with the autofocus.	16.96192	144.86759	3277	163	2016-12-10T01_28_03.532954_S5K.jpg
2016-12-10	01:28	Crack of white with squat lobsters.	16.96190	144.86761	3277	144	S5K17959.jpg
2016-12-10	01:29	White cracks with ha little venting. Anemones and mini chimneys.	16.96189	144.86762	3280	144	S5K17979.jpg
2016-12-10	01:29	Inactive chimneys with maybe a little venting.	16.96185	144.86767	3282	141	2016-12-10T01_29_34.528255_S5K.jpg
2016-12-10	01:30	Dead chimneys and some animals.	16.96183	144.86766	3281	125	1481333409707S5K18049.jpg
2016-12-10	01:30	Old flange on the chimney beyond.	16.96180	144.86765	3282	98	2016-12-10T01_30_33.522839_S5K.jpg
2016-12-10	01:31	Slight touchdown.	16.96181	144.86763	3281	94	2016-12-10T01_31_15.522648_S5K.jpg
2016-12-10	01:31	Looking east.	16.96181	144.86766	3280	96	S5K18142.jpg
2016-12-10	01:33	Old flange.	16.96185	144.86777	3281	170	S5K18240.jpg
2016-12-10	01:33	Took a view of these older chimneys before heading south to Alba.	16.96182	144.86776	3279	170	2016-12-10T01_33_48.502478_S5K.jpg
2016-12-10	01:34	Seeing milky fluid	16.96161	144.86776	3283	171	2016-12-10T01_34_46.530817_S5K.jpg
2016-12-10	01:35	Another patch of older chimneys.	16.96155	144.86776	3284	162	2016-12-10T01_35_12.524846_S5K.jpg
2016-12-10	01:35	Back on flat bottom.	16.96148	144.86782	3283	166	2016-12-10T01_35_41.520936_S5K.jpg
2016-12-10	01:35	More flow and chimney in front of us.	16.96144	144.86783	3282	160	2016-12-10T01_35_53.528829_S5K.jpg
2016-12-10	01:36	We are 20m from Alba so this looks like a different chimney.	16.96137	144.86783	3280	160	S5K18430.jpg
2016-12-10	01:36	Black smoke so maybe it is Alba as we get closer.	16.96133	144.86784	3277	155	S5K18458.jpg
2016-12-10	01:38	Getting a good view of Alba from the northwest side.	16.96128	144.86784	3277	121	S5K18547.jpg
2016-12-10	01:38	Sulfide block mound with chimneys on top.	16.96127	144.86785	3276	114	2016-12-10T01_38_48.512975_S5K.jpg
2016-12-10	01:41	Highlights on at 140 while we traverse Alba	16.96130	144.86790	3276	164	
2016-12-10	01:41	Circling around clockwise.	16.96130	144.86790	3276	174	S5K18714.jpg
2016-12-10	01:43	Circling back counter-clockwise after going half way around.	16.96120	144.86793	3274	297	2016-12-10T01_43_16.509674_S5K.jpg
2016-12-10	01:45	Highlights off	16.96126	144.86785	3275	100	
2016-12-10	01:45	Going to land in front of the black smokers facing E where can land on the lava.	16.96127	144.86785	3276	102	2016-12-10T01_45_06.520568_S5K.jpg
2016-12-10	01:48	Some snails on the chimneys in the background.	16.96128	144.86787	3277	104	2016-12-10T01_48_29.525058_S5K.jpg
2016-12-10	01:49	On the seafloor and having a look.	16.96127	144.86788	3277	105	S5K19231.jpg
2016-12-10	01:53	Looking for areas of diffuse flow to sample.	16.96121	144.86779	3277	103	2016-12-10T01_53_44.537042_S5K.jpg
2016-12-10	01:55	Checking temperature in this crack.	16.96124	144.86783	3277	99	2016-12-10T01_55_43.517508_S5K.jpg
2016-12-10	01:56	Only 4 deg C.	16.96124	144.86782	3277	101	2016-12-10T01_56_26.527318_S5K.jpg
2016-12-10	01:57	6deg down there...going up a little.	16.96128	144.86781	3277	102	2016-12-10T01_57_34.529748_S5K.jpg
2016-12-10	01:57	Up to 10 deg.	16.96130	144.86778	3277	102	S5K19718.jpg
2016-12-10	01:58	Crab got a shrimp.	16.96130	144.86776	3277	101	2016-12-10T01_58_14.537480_S5K.jpg
2016-12-10	01:59	Crab with shrimp in upper left.	16.96126	144.86777	3277	101	S5K19815.jpg
2016-12-10	02:00	8deg and going up slowly.	16.96126	144.86778	3277	99	2016-12-10T02_00_19.531436_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	02:01	Taking a sensor reading here.	16.96126	144.86779	3277	100	S5K19901.jpg
2016-12-10	02:02	highlights for Thom imagery	16.96125	144.86781	3277	99	2016-12-10T02_02_19.550999_S5K.jpg
2016-12-10	02:02	Temp=11.5 pH=6.28 O2=2.33 ml/l.	16.96125	144.86781	3277	99	2016-12-10T02_02_25.518941_S5K.jpg
2016-12-10	02:02	Temp still going up a bit here.	16.96126	144.86781	3277	101	2016-12-10T02_02_58.519052_S5K.jpg
2016-12-10	02:03	Turning off sensors.	16.96126	144.86782	3277	100	S5K20040.jpg
2016-12-10	02:03	Palm worms here.	16.96126	144.86782	3277	101	2016-12-10T02_03_32.531782_S5K.jpg
2016-12-10	02:04	S43-HFS-03 Start 02:04 Unfiltered Bag #16 Base of Alba Vent in a crack where the shimmering water is coming over. Can see some exhaust.	16.96126	144.86782	3277	101	2016-12-10T02_04_27.562454_S5K.jpg
2016-12-10	02:05	Pulled out of the crack.	16.96125	144.86783	3277	103	2016-12-10T02_05_51.541970_S5K.jpg
2016-12-10	02:06	Stopped. May try again here.	16.96126	144.86783	3277	103	
2016-12-10	02:07	Getting pulled off.	16.96127	144.86783	3277	105	
2016-12-10	02:07	Overview.	16.96128	144.86784	3277	102	2016-12-10T02_07_23.543367_S5K.jpg
2016-12-10	02:09	Trying for that v-shape in the rock (upside down V).	16.96131	144.86789	3278	101	2016-12-10T02_09_00.548532_S5K.jpg
2016-12-10	02:09	Peripheral rocks at base with Munidopsis, Neoverruca and Provanna along with stray shrimp and crabs.	16.96131	144.86789	3278	99	2016-12-10T02_09_10.520273_S5K.jpg
2016-12-10	02:11	Low smoking chimneys with small snail clusters, chorocarids and crab along with Paralvinella hessleri alvinellids.	16.96126	144.86788	3277	98	S5K20506.jpg
2016-12-10	02:11	Tiny shrimp in crack.	16.96125	144.86786	3277	98	2016-12-10T02_11_31.539499_S5K.jpg
2016-12-10	02:16	Back over to the original crack.	16.96121	144.86786	3277	101	S5K20808.jpg
2016-12-10	02:16	Not in view on science camera.	16.96120	144.86787	3277	102	
2016-12-10	02:17	Turned sampler back on again.	16.96121	144.86789	3277	100	2016-12-10T02_17_52.539683_S5K.jpg
2016-12-10	02:18	ROV is not stable here and wiggles out of the crevice.	16.96124	144.86788	3277	100	
2016-12-10	02:19	Not getting good exhaust. Stopping and starting again.	16.96125	144.86789	3277	100	S5K20980.jpg
2016-12-10	02:19	Seeing a little bit of flow in exhaust.	16.96127	144.86789	3277	100	2016-12-10T02_19_25.532601_S5K.jpg
2016-12-10	02:20	Seeing just a trickle of flow.	16.96127	144.86789	3277	100	2016-12-10T02_20_10.553530_S5K.jpg
2016-12-10	02:20	Highlights on.	16.96127	144.86789	3277	99	S5K21072.jpg
2016-12-10	02:21	Stop. Tmax=13.3 Tavg=9.6 vol=559 T2=4. Not a good sample.	16.96128	144.86789	3277	99	S5K21103.jpg
2016-12-10	02:27	7.5deg and going up a bit.	16.96129	144.86792	3277	97	2016-12-10T02_27_15.539357_S5K.jpg
2016-12-10	02:27	8.2°C here.	16.96129	144.86791	3277	96	2016-12-10T02_27_43.536376_S5K.jpg
2016-12-10	02:28	Trying the small hole under the snails.	16.96127	144.86791	3277	94	2016-12-10T02_28_33.552188_S5K.jpg
2016-12-10	02:29	Only 5.5deg in the hole.	16.96127	144.86791	3277	93	S5K21583.jpg
2016-12-10	02:30	Highlights off	16.96127	144.86790	3277	94	
2016-12-10	02:30	9.7deg against the wall.	16.96128	144.86789	3277	94	2016-12-10T02_30_40.541907_S5K.jpg
2016-12-10	02:32	Another spot...11.5.....12.....	16.96127	144.86787	3277	93	2016-12-10T02_32_07.534638_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	02:32	Got up to over 13°C.	16.96126	144.86786	3277	93	2016-12-10T02_32_53.545960_S5K.jpg
2016-12-10	02:35	HFS sensor reading in this spot.	16.96127	144.86788	3277	93	2016-12-10T02_35_20.557579_S5K.jpg
2016-12-10	02:36	Temp=14.6 pH=6.1 O2=1.86 at that location.	16.96126	144.86788	3277	93	2016-12-10T02_36_35.556962_S5K.jpg
2016-12-10	02:37	Sensor reading one record before this.	16.96126	144.86788	3277	93	
2016-12-10	02:37	Going to try for a hot sample instead.	16.96126	144.86788	3277	94	S5K22082.jpg
2016-12-10	02:38	Going to try here.	16.96126	144.86788	3277	93	S5K22120.jpg
2016-12-10	02:39	Sensors off.	16.96125	144.86787	3277	95	
2016-12-10	02:41	Larger hole now.	16.96126	144.86787	3277	87	2016-12-10T02_41_25.553877_S5K.jpg
2016-12-10	02:43	Sideways hole.	16.96127	144.86786	3277	90	2016-12-10T02_42_58.546174_S5K.jpg
2016-12-10	02:45	131deg and going up.	16.96127	144.86786	3277	88	1481337902681S5K22542.jpg
2016-12-10	02:45	S43-HFS-04 Start 02:45. Filtered Piston #1. Seeing some flow in the exhaust but not strong. Vent that was excavated slightly.	16.96127	144.86786	3277	88	2016-12-10T02_45_28.568287_S5K.jpg
2016-12-10	02:46	Highlights on	16.96127	144.86786	3277	88	
2016-12-10	02:48	Little black bug above the snail.	16.96127	144.86787	3277	88	2016-12-10T02_48_03.565687_S5K.jpg
2016-12-10	02:51	Stop. Tmax=209 Tavg=166 vol=650 T2=10. Flush pump in bursts and the sample stopped on its own with P1 sudden obstruction (a good sign).	16.96127	144.86788	3277	88	2016-12-10T02_51_17.547525_S5K.jpg
2016-12-10	02:53	S43-HFS-05 Start 02:53 Unfiltered Piston #2. Same location as HFS-04 on the lower part of Alba Vent. Running the flush pump on this one. Can see some exhaust flow.	16.96127	144.86787	3277	87	2016-12-10T02_53_32.546326_S5K.jpg
2016-12-10	02:56	Highlights on at 02:47 and off at 02:56	16.96127	144.86785	3277	87	
2016-12-10	02:56	Temperature came down when turned off the flush pump.	16.96127	144.86785	3277	87	S5K23258.jpg
2016-12-10	03:02	Stop. Tmax=219 Tavg=193 vol=625 T2=50.	16.96126	144.86786	3277	86	2016-12-10T03_02_01.546238_S5K.jpg
2016-12-10	03:04	S43-HFS-06 Start 03:04 Filtered Piston #3 Same exact location as the last two samples.	16.96125	144.86787	3277	86	2016-12-10T03_04_55.559459_S5K.jpg
2016-12-10	03:07	Turned flush pump on again.	16.96125	144.86787	3277	86	2016-12-10T03_07_09.565646_S5K.jpg
2016-12-10	03:09	Stopped the flush pump when nozzle moved.	16.96125	144.86786	3277	85	S5K24015.jpg
2016-12-10	03:10	Turning the pump back on.	16.96126	144.86787	3277	85	2016-12-10T03_10_33.576637_S5K.jpg
2016-12-10	03:13	Stop. Tmax=238.6 Tavg=120 vol=800 T2=50.	16.96132	144.86786	3277	85	S5K24256.jpg
2016-12-10	03:14	Gauge reading.	16.96131	144.86786	3277	85	2016-12-10T03_14_15.547414_S5K.jpg
2016-12-10	03:14	Done with water sampling here but may try a gas sample.	16.96131	144.86786	3277	85	
2016-12-10	03:16	Putting HFS away.	16.96126	144.86787	3277	84	2016-12-10T03_16_21.581877_S5K.jpg
2016-12-10	03:18	Done.	16.96122	144.86789	3278	82	2016-12-10T03_18_53.562271_S5K.jpg
2016-12-10	03:20	Going to try and get the gastight.	16.96126	144.86788	3278	77	S5K24698.jpg
2016-12-10	03:25	Retrieved the gas tight bottle from the milk crate.	16.96128	144.86788	3278	80	2016-12-10T03_25_58.593595_S5K.jpg
2016-12-10	03:26	Not a good fit with the ram.	16.96128	144.86788	3278	81	2016-12-10T03_26_33.566321_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	03:27	Looks extended further than before.	16.96128	144.86788	3278	75	2016-12-10T03_26_56.590942_S5K.jpg
2016-12-10	03:30	Decided not to use this gastight.	16.96130	144.86787	3278	75	S5K25253.jpg
2016-12-10	03:31	Stowing the sampler.	16.96130	144.86788	3278	75	2016-12-10T03_31_13.569700_S5K.jpg
2016-12-10	03:32	The ram had come up and on a bottle up here on the surface, that should easily go down to the level of the o-ring. Could gently move the ram and it should slide down without firing.	16.96131	144.86786	3278	75	S5K25398.jpg
2016-12-10	03:34	Testing the port arm which was having an issue.	16.96130	144.86784	3278	73	2016-12-10T03_34_31.572998_S5K.jpg
2016-12-10	03:35	Doing a reset on the port arm.	16.96129	144.86784	3278	72	
2016-12-10	03:38	Looks like the o-ring is at the edge of the bottle.	16.96127	144.86785	3278	71	2016-12-10T03_38_25.580476_S5K.jpg
2016-12-10	03:39	Need to get the gastight back in the other arm.	16.96125	144.86785	3278	67	S5K25835.jpg
2016-12-10	03:40	Feel on the side of the crate.	16.96126	144.86785	3278	68	S5K25889.jpg
2016-12-10	03:41	Looks like the marker pulled the ram back out.	16.96126	144.86785	3278	68	2016-12-10T03_41_43.567138_S5K.jpg
2016-12-10	03:46	Got the gastight! Whew!	16.96126	144.86786	3278	68	2016-12-10T03_46_54.586250_S5K.jpg
2016-12-10	03:46	Getting the gastight in the correct configuration.	16.96126	144.86786	3278	68	2016-12-10T03_46_54.586250_S5K.jpg
2016-12-10	03:49	Successful transfer.	16.96126	144.86787	3278	67	2016-12-10T03_49_23.602043_S5K.jpg
2016-12-10	03:49	Just fits.	16.96126	144.86787	3278	68	2016-12-10T03_49_52.601259_S5K.jpg
2016-12-10	03:50	Ready to sample.	16.96127	144.86787	3278	68	2016-12-10T03_50_12.579804_S5K.jpg
2016-12-10	03:50	Eel!	16.96127	144.86787	3278	65	S5K26477.jpg
2016-12-10	03:51	Got a couple of images of the eel.	16.96127	144.86787	3278	66	
2016-12-10	03:53	Doing a slight repositioning of the ROV to reach the black smoker.	16.96127	144.86786	3278	67	2016-12-10T03_53_04.581581_S5K.jpg
2016-12-10	03:55	Looks like a good position.	16.96128	144.86785	3278	89	S5K26763.jpg
2016-12-10	03:56	Good angle.	16.96127	144.86785	3278	89	2016-12-10T03_56_11.607707_S5K.jpg
2016-12-10	04:01	S43-GTB-07 Fired. In the black smoke in the smoker in the back of the small chimney in front. When fired saw the wand go further in the orifice. Same hole as the HFS samples here but at a slightly different angle.	16.96124	144.86785	3278	89	
2016-12-10	04:03	Great sample.	16.96126	144.86785	3278	89	
2016-12-10	04:03	Need to put the sampler back in the crate.	16.96126	144.86785	3278	88	2016-12-10T04_03_31.612650_S5K.jpg
2016-12-10	04:03	Next will want to take a sulfide sample of a chimney here.	16.96126	144.86786	3278	89	S5K27269.jpg
2016-12-10	04:06	Sampler is in the crate.	16.96125	144.86786	3278	88	
2016-12-10	04:07	Going to try to use a scoop and manipulator to get a chimney.	16.96126	144.86786	3278	88	
2016-12-10	04:09	Using the net instead of the scoop as the latter is too short.	16.96126	144.86786	3278	85	
2016-12-10	04:12	Got the net.	16.96126	144.86785	3278	82	1481343123834S5K27763.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	04:12	Want a sulfide that has black smoke coming out of it.	16.96126	144.86785	3278	83	2016-12-10T04_12_27.605529_S5K.jpg
2016-12-10	04:13	Good one there.	16.96126	144.86785	3278	84	2016-12-10T04_13_50.593401_S5K.jpg
2016-12-10	04:15	That piece bounced off the rim of the net.	16.96128	144.86786	3278	82	2016-12-10T04_15_06.597605_S5K.jpg
2016-12-10	04:17	Some tiny pieces came off that chimney but going for a bigger piece.	16.96125	144.86786	3278	82	S5K28094.jpg
2016-12-10	04:20	Back up as the vehicle is moving.	16.96125	144.86785	3277	84	
2016-12-10	04:20	S43-Geo-08 Sulfide sample of the black smokers in the same area that HFS and gastights taken.	16.96125	144.86783	3278	92	S5K28287.jpg
2016-12-10	04:22	Pieces of chimney fell into net after claw excavated in two places.	16.96126	144.86784	3276	95	
2016-12-10	04:22	Placed in stbd side of aft biobox.	16.96126	144.86782	3277	98	S5K28413.jpg
2016-12-10	04:23	Next will try to take some microbiology samples with the Beast.	16.96125	144.86781	3277	97	
2016-12-10	04:24	Looking for diffuse flow on Alba.	16.96124	144.86781	3274	97	
2016-12-10	04:24	Looking for a stable landing spot to sample for an hour.	16.96123	144.86785	3275	98	S5K28524.jpg
2016-12-10	04:27	Looking for water over 20°C.	16.96126	144.86786	3277	101	2016-12-10T04_27_57.603504_S5K.jpg
2016-12-10	04:29	That was where the chimney broke.	16.96129	144.86783	3277	98	2016-12-10T04_29_56.629395_S5K.jpg
2016-12-10	04:30	S43-HFS-09 Start 04:30 LVB #24. In diffuse flow just below the black smokers sampled near the base of Alba Vent. See exhaust.	16.96131	144.86782	3277	99	S5K28889.jpg
2016-12-10	04:32	Sample takes about 30 minutes so will take some biology video at the same time.	16.96132	144.86784	3277	97	2016-12-10T04_32_50.584653_S5K.jpg
2016-12-10	04:33	Temperature is about 14°C at the moment.	16.96131	144.86786	3277	97	2016-12-10T04_33_53.609716_S5K.jpg
2016-12-10	04:34	Lasers on.	16.96130	144.86787	3277	97	S5K29106.jpg
2016-12-10	04:36	Steady temperature of 15°C.	16.96128	144.86790	3277	97	S5K29209.jpg
2016-12-10	04:47	Overview of sampling site.	16.96127	144.86786	3277	96	S5K29904.jpg
2016-12-10	04:49	Scaleworm.	16.96129	144.86786	3277	96	2016-12-10T04_49_16.612005_S5K.jpg
2016-12-10	04:51	Barnacles, scale worms, limpets, shrimp and crabs.	16.96127	144.86785	3277	96	S5K30113.jpg
2016-12-10	04:53	Stop. Tmax=16.3 Tavg=14.7 vol=3200ml T2=8.	16.96124	144.86784	3277	96	
2016-12-10	04:54	S43-HFS-10 Start 04:54 RNA Filter #10 Same location as LVB HFS-09.	16.96122	144.86785	3277	96	S5K30330.jpg
2016-12-10	05:03	Lots of bacteria coating the carapace.	16.96128	144.86786	3277	94	2016-12-10T05_03_46.610261_S5K.jpg
2016-12-10	05:04	Probably a sick crab.	16.96128	144.86785	3277	94	S5K30883.jpg
2016-12-10	05:04	Or sick squat lobster.	16.96128	144.86786	3277	94	2016-12-10T05_04_45.636411_S5K.jpg
2016-12-10	05:21	Stop. Tmax=16.4 Tavg=14.1 vol=3002 T2=8.	16.96122	144.86788	3277	93	S5K31915.jpg
2016-12-10	05:24	S43-HFS-11 Start 05:24 Unfiltered Bag #22 At the same site as the LVB sample on Alba Vent.	16.96126	144.86786	3277	93	2016-12-10T05_24_48.630237_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	05:27	Stop. Tmax=16.7 Tavg=16 vol=401 T2=8	16.96126	144.86785	3277	94	
2016-12-10	05:28	S43-HFS-12 Start 05:28 Filtered Bag #21. Same exact location as HFS-13 and LVB.	16.96126	144.86785	3277	94	2016-12-10T05_28_11.616844_S5K.jpg
2016-12-10	05:30	Sampler working well. Good exhaust.	16.96128	144.86785	3277	93	2016-12-10T05_30_34.639382_S5K.jpg
2016-12-10	05:30	Stop. Tmax=16.6 Tavg=15.5 T2=9 vol=403	16.96128	144.86785	3277	93	
2016-12-10	05:31	S42-HFS-13 Start 05:31 Unfiltered Bag #20 Same exact location as LVB and previous HFS sample.	16.96126	144.86785	3277	93	2016-12-10T05_31_40.637732_S5K.jpg
2016-12-10	05:34	Stop. Tmax=16.1 Tavg=15.4 T2=8.5 vol=401ml/l.	16.96126	144.86786	3277	93	S5K32692.jpg
2016-12-10	05:34	Taking HFS sensor readings. (Port 12)	16.96125	144.86786	3277	93	2016-12-10T05_34_43.602946_S5K.jpg
2016-12-10	05:35	Today so far the HFS has pumped 27 liters of water.	16.96124	144.86787	3277	93	2016-12-10T05_35_37.618070_S5K.jpg
2016-12-10	05:40	O2=1.84 pH=6.05 Temp=15 Sensors at this site.	16.96126	144.86787	3277	93	2016-12-10T05_40_55.629268_S5K.jpg
2016-12-10	05:41	Turning of the flush pumps.	16.96126	144.86788	3277	93	S5K33145.jpg
2016-12-10	05:43	Stowing the wand.	16.96126	144.86787	3277	89	2016-12-10T05_43_22.637100_S5K.jpg
2016-12-10	05:44	Cleaning out the lines of the HFS by pumping some seawater.	16.96125	144.86787	3277	87	
2016-12-10	05:45	Next will retrieve the puck from the basket.	16.96124	144.86786	3277	90	
2016-12-10	05:46	SPME is the puck.	16.96124	144.86786	3277	84	
2016-12-10	05:48	Retrieving the SPME puck out of the forward biobox.	16.96127	144.86785	3277	85	2016-12-10T05_48_30.646348_S5K.jpg
2016-12-10	05:51	Holding down the biobox down with the stbd arm to pull this out with the port arm.	16.96127	144.86785	3277	83	2016-12-10T05_51_01.626399_S5K.jpg
2016-12-10	05:52	This is SPME #4.	16.96128	144.86786	3277	82	S5K33789.jpg
2016-12-10	06:11	Good grip.	16.96128	144.86789	3277	71	2016-12-10T06_11_14.666261_S5K.jpg
2016-12-10	06:12	Got it in position.	16.96127	144.86789	3277	66	S5K34961.jpg
2016-12-10	06:13	Was not square in the claw and slipped.	16.96127	144.86788	3277	64	2016-12-10T06_13_41.671927_S5K.jpg
2016-12-10	06:13	Try it again.	16.96127	144.86788	3277	64	S5K35076.jpg
2016-12-10	06:16	Getting another grip on the sampler.	16.96126	144.86788	3277	64	2016-12-10T06_16_29.678564_S5K.jpg
2016-12-10	06:18	Going to place the puck in the diffuse flow where the LVB was taken.	16.96125	144.86788	3277	64	2016-12-10T06_17_59.669205_S5K.jpg
2016-12-10	06:19	S43-Bio-14 SPME #4 Puck squeezing in the diffuse flow of the LVB sample at Able Vent.	16.96126	144.86787	3277	64	
2016-12-10	06:20	Highlights on	16.96125	144.86787	3277	64	
2016-12-10	06:20	The puck stays in the flow for 10 minutes while squeezed.	16.96125	144.86787	3277	64	
2016-12-10	06:23	Looks like the rope side of the puck is facing toward the outside of the flow away from the chimney.	16.96126	144.86788	3277	64	2016-12-10T06_23_20.694085_S5K.jpg
2016-12-10	06:24	Highlights off	16.96126	144.86788	3277	64	
2016-12-10	06:32	Done squeezing and ready to retrieve.	16.96127	144.86786	3277	64	2016-12-10T06_32_00.704300_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	06:32	Placing the puck back into the forward-stbd quarter of the biobox.	16.96126	144.86787	3277	64	2016-12-10T06_32_33.701194_S5K.jpg
2016-12-10	06:33	Done sampling at Alba Vent for today.	16.96126	144.86787	3277	64	2016-12-10T06_33_25.718518_S5K.jpg
2016-12-10	06:34	Going to turn to the west to head for Sequoia Chimney at waypoint #2. Turning clockwise.	16.96133	144.86780	3275	27	
2016-12-10	06:36	Moving west flying above the bottom.	16.96126	144.86758	3279	241	
2016-12-10	06:36	Can see Sequoia on the sonar already.	16.96118	144.86729	3279	266	S5K36457.jpg
2016-12-10	06:37	Seeing the base of Sequoia.	16.96122	144.86714	3281	276	2016-12-10T06_37_49.698535_S5K.jpg
2016-12-10	06:39	Will attempt a video survey from bottom to top.	16.96132	144.86714	3284	320	
2016-12-10	06:39	Different type of fish	16.96135	144.86714	3284	303	2016-12-10T06_39_45.684464_S5K.jpg
2016-12-10	06:40	Having to nudge the sampling sled back in with the stbd arm.	16.96134	144.86711	3283	282	S5K36648.jpg
2016-12-10	06:42	There is the marker that we let go from above on an earlier dive.	16.96130	144.86698	3278	210	2016-12-10T06_41_54.682222_S5K.jpg
2016-12-10	06:42	Marker 254 Mkr-254!	16.96122	144.86691	3280	110	2016-12-10T06_42_43.692866_S5K.jpg
2016-12-10	06:43	Lovely photos of the marker!	16.96122	144.86693	3282	123	S5K36851.jpg
2016-12-10	06:43	The anchor of Mkr-254.	16.96123	144.86693	3282	144	2016-12-10T06_44_07.676877_S5K.jpg
2016-12-10	06:44	Marker is on the base of Sequoia at 145 deg of heading in old blocks of sulfides and squat lobsters.	16.96122	144.86693	3281	146	S5K36905.jpg
2016-12-10	06:45	Going to start on the north side of Sequoia and moving up.	16.96123	144.86695	3279	166	2016-12-10T06_45_18.683886_S5K.jpg
2016-12-10	06:46	Highlights on for biological survey of Sequoia chimney.	16.96122	144.86695	3277	177	2016-12-10T06_46_19.715330_S5K.jpg
2016-12-10	07:04	Highlights off.	16.96121	144.86699	3260	203	S5K38113.jpg
2016-12-10	07:05	Moving around to look at the west face of Sequoia. Just finished the north face video survey.	16.96118	144.86688	3265	132	
2016-12-10	07:09	Going to start the west face from the dark area near the base.	16.96114	144.86688	3279	95	2016-12-10T07_08_59.723273_S5K.jpg
2016-12-10	07:09	Highlights on 2nd pass, bio survey of Sequoia.	16.96114	144.86689	3277	98	2016-12-10T07_09_43.748045_S5K.jpg
2016-12-10	07:21	We have MAPR data coming in live.	16.96114	144.86696	3260	105	2016-12-10T07_21_04.770183_S5K.jpg
2016-12-10	07:23	Highlights off.	16.96115	144.86695	3255	131	2016-12-10T07_23_26.720674_S5K.jpg
2016-12-10	07:24	Spinning around the top to come down to the base and video another side of this chimney.	16.96114	144.86704	3255	243	2016-12-10T07_24_04.731093_S5K.jpg
2016-12-10	07:26	Starting at the base looking at the east side of the chimney.	16.96112	144.86705	3277	274	2016-12-10T07_26_25.752284_S5K.jpg
2016-12-10	07:27	Heading up Sequoia again. Looking at the east face.	16.96112	144.86704	3277	274	2016-12-10T07_27_39.773444_S5K.jpg
2016-12-10	07:28	Highlights on, 3rd pass biological survey of Sequoia.	16.96112	144.86706	3274	275	2016-12-10T07_28_34.769262_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	07:29	Nice little chimney.	16.96112	144.86704	3271	274	2016-12-10T07_29_53.771683_S5K.jpg
2016-12-10	07:30	Moving on up the east side.	16.96112	144.86704	3271	272	2016-12-10T07_30_14.756268_S5K.jpg
2016-12-10	07:32	Limpet land.	16.96112	144.86701	3266	273	2016-12-10T07_32_08.765668_S5K.jpg
2016-12-10	07:32	Shrimp zone.	16.96112	144.86701	3265	276	S5K39781.jpg
2016-12-10	07:37	Coming to the top of the east side of Sequoia.	16.96111	144.86702	3255	272	S5K40067.jpg
2016-12-10	07:37	Shrimp on top.	16.96111	144.86701	3254	272	2016-12-10T07_37_44.767308_S5K.jpg
2016-12-10	07:37	Done with the east side of the chimney.	16.96111	144.86701	3254	273	2016-12-10T07_37_56.777151_S5K.jpg
2016-12-10	07:38	Completed 3 sides of Sequoia for video survey. Did not do the south side.	16.96111	144.86701	3254	271	2016-12-10T07_38_16.785367_S5K.jpg
2016-12-10	07:38	Highlights off.	16.96111	144.86702	3253	272	2016-12-10T07_38_26.764673_S5K.jpg
2016-12-10	07:38	Coming off bottom.	16.96112	144.86703	3252	271	

Table 6.6-9 Dive S43 – Hafa Adai

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	23:10	There is the bottom.	16.96835	144.86499	3273	84	
2016-12-09	23:10	Ropy sheet flow on the west side of the crater rim.	16.96834	144.86499	3279	79	2016-12-09T23_10_50.431917_S5K.jpg
2016-12-09	23:11	Some sediment coating the lava.	16.96833	144.86498	3280	61	2016-12-09T23_11_18.428364_S5K.jpg
2016-12-09	23:11	Backing up a little bit to get the loose pieces seen on the rear camera.	16.96832	144.86496	3279	55	2016-12-09T23_11_50.427070_S5K.jpg
2016-12-09	23:13	Setting up to grab a rock from this small pit.	16.96830	144.86490	3280	153	2016-12-09T23_13_50.445422_S5K.jpg
2016-12-09	23:14	HD video started a few minutes after reaching the bottom.	16.96830	144.86490	3280	152	
2016-12-09	23:14	Nice view of filter feeders on the edge of this small collapse.	16.96829	144.86490	3280	152	S5K09929.jpg
2016-12-09	23:15	Not a big enough piece.	16.96828	144.86490	3280	152	2016-12-09T23_15_42.420947_S5K.jpg
2016-12-09	23:16	Comatulid unstaked crinoids.	16.96828	144.86490	3280	152	S5K09999.jpg
2016-12-09	23:16	Switching arms to sample a rock.	16.96828	144.86491	3280	152	S5K10021.jpg
2016-12-09	23:19	First sample fell out of the grip before placing it in the biobox.	16.96825	144.86481	3280	151	S5K10183.jpg
2016-12-09	23:21	S43-Geo-01 Piece of lava from a collapse feature taken from outside of the cone near waypoint 10. Placed in aft-port quarter of biobox.	16.96820	144.86493	3280	152	1481325669508S5K10309.jpg
2016-12-09	23:22	<i>SuBastian</i> backed up from the landing site to find a loose piece of lava within the jumbled sheet flow outside of the crater.	16.96828	144.86486	3280	152	S5K10410.jpg
2016-12-09	23:24	Collapse pit.	16.96827	144.86484	3279	153	2016-12-09T23_24_29.455636_S5K.jpg
2016-12-09	23:24	HD video which is converted to other format is down. Engineers are working on it.	16.96825	144.86483	3279	123	S5K10521.jpg
2016-12-09	23:26	Very flat and sedimented.	16.96826	144.86490	3277	44	S5K10627.jpg
2016-12-09	23:26	Flat sheet flow.	16.96829	144.86493	3278	44	2016-12-09T23_26_49.457469_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	23:27	Quite a bit of sediment and filter feeders so flow wasn't recent (100 years ago?).	16.96833	144.86497	3279	44	2016-12-09T23_27_20.468271_S5K.jpg
2016-12-09	23:27	Wall of crater is on sonar ahead of us.	16.96837	144.86501	3279	44	2016-12-09T23_27_55.466217_S5K.jpg
2016-12-09	23:29	We are still a bit west of waypoint 10 and the cone.	16.96843	144.86512	3281	43	2016-12-09T23_29_07.473315_S5K.jpg
2016-12-09	23:29	HD converter feed is now on line.	16.96848	144.86518	3281	45	
2016-12-09	23:29	Flat and heavy sediment.	16.96848	144.86520	3281	44	S5K10812.jpg
2016-12-09	23:30	A few dandelions.	16.96849	144.86527	3281	43	2016-12-09T23_30_02.464873_S5K.jpg
2016-12-09	23:31	Jumbled flow here.	16.96851	144.86545	3280	43	2016-12-09T23_31_19.471735_S5K.jpg
2016-12-09	23:31	Brittle stars.	16.96852	144.86550	3279	58	2016-12-09T23_31_31.445963_S5K.jpg
2016-12-09	23:32	Starting to get at the edge of the cone.	16.96850	144.86557	3276	87	S5K10979.jpg
2016-12-09	23:32	Going up the slope.	16.96849	144.86559	3273	88	2016-12-09T23_32_34.438901_S5K.jpg
2016-12-09	23:32	Cone is made of lava.	16.96848	144.86562	3270	89	S5K11007.jpg
2016-12-09	23:33	Climbing up the west wall.	16.96848	144.86570	3263	88	2016-12-09T23_33_31.458780_S5K.jpg
2016-12-09	23:34	Common name of crinoids is &"feather stars";.	16.96847	144.86581	3264	87	
2016-12-09	23:34	Climbing further up the slope.	16.96847	144.86585	3263	87	S5K11130.jpg
2016-12-09	23:35	Chaotic flow.	16.96846	144.86595	3261	87	S5K11169.jpg
2016-12-09	23:36	Approaching the top.	16.96845	144.86601	3258	87	2016-12-09T23_35_59.443485_S5K.jpg
2016-12-09	23:36	Rim?	16.96845	144.86606	3257	87	2016-12-09T23_36_29.434637_S5K.jpg
2016-12-09	23:36	Bathy shows a shear drop-off to the inside of the crater.	16.96844	144.86609	3256	87	1481326613719S5K11253.jpg
2016-12-09	23:37	Not the top yet. Was an optical illusion.	16.96842	144.86613	3255	87	2016-12-09T23_37_11.440836_S5K.jpg
2016-12-09	23:37	Flattened lobes.	16.96841	144.86616	3254	88	2016-12-09T23_37_28.462788_S5K.jpg
2016-12-09	23:37	Crater's edge.	16.96839	144.86624	3253	87	2016-12-09T23_37_59.459436_S5K.jpg
2016-12-09	23:38	Crested the edge and will go over then turn 180deg to see the wall as we descend.	16.96840	144.86629	3251	88	
2016-12-09	23:38	Twirling to port.	16.96837	144.86633	3252	23	2016-12-09T23_38_50.437317_S5K.jpg
2016-12-09	23:39	Last framegrab had a jellyfish.	16.96840	144.86639	3253	261	S5K11428.jpg
2016-12-09	23:40	Coming down the wall of the crater looking at the west wall from the inside of the crater.	16.96839	144.86638	3253	259	2016-12-09T23_40_04.455769_S5K.jpg
2016-12-09	23:40	Solid lava wall.	16.96841	144.86640	3257	258	2016-12-09T23_40_41.456157_S5K.jpg
2016-12-09	23:40	Practically vertical.	16.96841	144.86641	3260	256	2016-12-09T23_40_58.431812_S5K.jpg
2016-12-09	23:41	Not smokey at all so probably no vents.	16.96840	144.86640	3272	263	2016-12-09T23_41_46.448698_S5K.jpg
2016-12-09	23:42	Close to the bottom.	16.96839	144.86641	3273	267	2016-12-09T23_42_06.432058_S5K.jpg
2016-12-09	23:42	Turning around to head out east into the crater. HFS is reading normal background pH.	16.96839	144.86642	3274	270	2016-12-09T23_42_15.444790_S5K.jpg
2016-12-09	23:42	Normal temperatures and no cloudy water.	16.96839	144.86641	3274	329	S5K11597.jpg
2016-12-09	23:42	pH is around 7.5 which is normal.	16.96838	144.86640	3275	25	S5K11614.jpg
2016-12-09	23:43	Heading out the open side of the crater where the lava flowed out.	16.96838	144.86642	3274	74	S5K11676.jpg
2016-12-09	23:44	Puzzling back-arc lava eruption.	16.96838	144.86644	3274	74	S5K11699.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-09	23:45	Slight rise as we come along the bottom of the crater.	16.96834	144.86654	3273	74	2016-12-09T23_45_10.460113_S5K.jpg
2016-12-09	23:45	Over on the south wall so will move over to the center of the crater.	16.96836	144.86660	3271	79	2016-12-09T23_45_34.448203_S5K.jpg
2016-12-09	23:45	Edge of the south crater.	16.96840	144.86661	3269	80	2016-12-09T23_45_59.440091_S5K.jpg
2016-12-09	23:46	That is the south wall of the crater.	16.96841	144.86664	3266	89	2016-12-09T23_46_27.462321_S5K.jpg
2016-12-09	23:46	Paused while waiting for the ship to start moving.	16.96837	144.86633	3265	95	2016-12-09T23_46_44.453460_S5K.jpg
2016-12-09	23:47	Turning a bit more into the center of the crater.	16.96831	144.86635	3253	88	2016-12-09T23_47_47.440447_S5K.jpg
2016-12-09	23:48	Coming over a bit of a saddle.	16.96833	144.86639	3253	91	1481327288634S5K11928.jpg
2016-12-09	23:48	We are probably in the southern half of the channel flowing west out of the crater.	16.96839	144.86674	3249	60	2016-12-09T23_48_52.443848_S5K.jpg
2016-12-09	23:49	Spinning to look north across the crater.	16.96845	144.86680	3246	12	2016-12-09T23_49_15.462121_S5K.jpg
2016-12-09	23:50	Coming back down after moving a bit north.	16.96856	144.86681	3253	24	2016-12-09T23_50_02.438301_S5K.jpg
2016-12-09	23:51	Sonar showing a channel between outcrops.	16.96859	144.86686	3255	50	2016-12-09T23_51_06.435388_S5K.jpg
2016-12-09	23:52	Coming down to the bottom after the dropoff.	16.96869	144.86707	3262	61	
2016-12-09	23:53	Chaotic flow out of the channel.	16.96881	144.86720	3268	83	2016-12-09T23_53_13.454382_S5K.jpg
2016-12-09	23:54	Seafloor gradually rising with more intact flows.	16.96892	144.86742	3266	85	2016-12-09T23_54_11.453744_S5K.jpg
2016-12-09	23:56	Turning south out of the channel of the caldera's flow.	16.96909	144.86789	3266	103	2016-12-09T23_55_59.454347_S5K.jpg
2016-12-09	23:57	Doing a spin to take a wrap out of the tether.	16.96908	144.86805	3268	57	
2016-12-09	23:57	Did a 360 and stopped.	16.96906	144.86804	3267	200	2016-12-09T23_57_43.462254_S5K.jpg
2016-12-09	23:58	Waiting for the ship to head south.	16.96904	144.86783	3266	223	2016-12-09T23_58_13.465460_S5K.jpg
2016-12-09	23:58	Star shape in the lava.	16.96903	144.86783	3267	228	2016-12-09T23_58_37.452279_S5K.jpg
2016-12-09	23:59	Glass sponge.	16.96900	144.86779	3269	214	2016-12-09T23_59_50.447056_S5K.jpg
2016-12-09	23:59	Stalked crinoid?	16.96900	144.86779	3269	213	S5K12633.jpg
2016-12-10	00:02	Stalked coral on the left and glass sponge on the right.	16.96903	144.86784	3269	213	S5K12808.jpg
2016-12-10	00:03	Closeup of the stalked coral.	16.96903	144.86787	3269	213	2016-12-10T00_03_23.425127_S5K.jpg
2016-12-10	00:03	Still waiting for the ship.	16.96902	144.86789	3269	213	2016-12-10T00_03_53.453738_S5K.jpg
2016-12-10	00:04	Starting to move to the southwest to Waypoint #13 after turning out of the channel flow at Waypoint #12.	16.96902	144.86789	3269	214	2016-12-10T00_04_58.447466_S5K.jpg
2016-12-10	00:07	Rough lava not for hiking.	16.96894	144.86773	3265	226	2016-12-10T00_07_10.448727_S5K.jpg
2016-12-10	00:08	There are the lasers that are 10cm apart.	16.96851	144.86755	3268	188	2016-12-10T00_08_53.460625_S5K.jpg
2016-12-10	00:09	Skirting the south side of the cone.	16.96843	144.86747	3265	209	S5K13215.jpg
2016-12-10	00:11	Stretched out on the tether.	16.96819	144.86743	3268	207	2016-12-10T00_11_06.456065_S5K.jpg
2016-12-10	00:11	Waiting for the ship to catch up.	16.96814	144.86740	3270	208	2016-12-10T00_11_24.445187_S5K.jpg
2016-12-10	00:12	Laser view of sponge.	16.96812	144.86746	3267	207	2016-12-10T00_12_51.463238_S5K.jpg
2016-12-10	00:13	Water comes out of the center of the sponge.	16.96815	144.86744	3266	206	2016-12-10T00_13_24.468435_S5K.jpg
2016-12-10	00:16	Could it be a brittle star on the sponge?	16.96815	144.86743	3272	199	S5K13614.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	00:16	Ship has caught up so off we go.	16.96815	144.86743	3272	199	2016-12-10T00_16_27.453593_S5K.jpg
2016-12-10	00:17	Still skirting the south side of the cone.	16.96811	144.86737	3269	196	2016-12-10T00_17_08.454595_S5K.jpg
2016-12-10	00:21	Getting close to the waypoint. The lava is smoother here.	16.96762	144.86716	3273	203	S5K13924.jpg
2016-12-10	00:22	Smooth pillow lobes.	16.96754	144.86714	3274	203	S5K13973.jpg
2016-12-10	00:22	Turning a bit more due south to check out a few cones.	16.96752	144.86713	3275	203	S5K13991.jpg
2016-12-10	00:23	Lavas are changing to a bit more jumbled and less smooth.	16.96748	144.86711	3276	203	S5K14029.jpg
2016-12-10	00:23	Moving over to the west to clear the ship and zone of safety.	16.96745	144.86711	3277	202	S5K14064.jpg
2016-12-10	00:24	Scanning to stbd at the waypoint.	16.96743	144.86710	3275	262	2016-12-10T00_24_22.460180_S5K.jpg
2016-12-10	00:25	Looking a bit north of due west.	16.96746	144.86701	3277	284	2016-12-10T00_25_27.468522_S5K.jpg
2016-12-10	00:26	This might be the rim of the tiny crater on the bathymetry.	16.96746	144.86694	3276	285	2016-12-10T00_26_08.479675_S5K.jpg
2016-12-10	00:26	Still approaching the small crater according to the sonar.	16.96753	144.86691	3274	278	2016-12-10T00_26_54.483659_S5K.jpg
2016-12-10	00:27	Pillow tubes coming down from the crater.	16.96755	144.86683	3274	262	2016-12-10T00_27_47.470313_S5K.jpg
2016-12-10	00:28	Edge of crater.	16.96754	144.86680	3273	261	2016-12-10T00_28_02.483664_S5K.jpg
2016-12-10	00:28	Looking down in the crater.	16.96752	144.86678	3272	252	2016-12-10T00_28_24.471562_S5K.jpg
2016-12-10	00:28	Sonar trace of the crater is great.	16.96750	144.86676	3272	233	S5K14366.jpg
2016-12-10	00:29	Shaft down into the crater.	16.96749	144.86672	3273	222	2016-12-10T00_29_14.463015_S5K.jpg
2016-12-10	00:29	Little staining.	16.96747	144.86671	3273	210	2016-12-10T00_29_33.487236_S5K.jpg
2016-12-10	00:30	Closeup of staining and no venting.	16.96744	144.86669	3273	183	2016-12-10T00_30_18.473078_S5K.jpg
2016-12-10	00:31	Going to head 140 toward the south.	16.96747	144.86669	3268	176	
2016-12-10	00:32	No evidence of venting on the sensors.	16.96740	144.86678	3270	139	
2016-12-10	00:33	Lots of little craters on the flanks of this cone.	16.96732	144.86687	3273	139	2016-12-10T00_33_22.476136_S5K.jpg
2016-12-10	00:34	Water may be a bit smokey but no animal evidence.	16.96716	144.86697	3271	138	2016-12-10T00_34_33.484958_S5K.jpg
2016-12-10	00:35	Another crater.	16.96706	144.86700	3269	139	S5K14769.jpg
2016-12-10	00:37	Heading due south.	16.96694	144.86722	3269	179	1481330228568S5K14868.jpg
2016-12-10	00:38	Coming over into another pit.	16.96675	144.86722	3272	181	
2016-12-10	00:40	No evidence of venting.	16.96656	144.86722	3278	181	S5K15045.jpg
2016-12-10	00:42	Heading due south still to waypoint #14.	16.96626	144.86736	3274	181	S5K15182.jpg
2016-12-10	00:44	Massive pillow lava with sediment.	16.96581	144.86733	3276	179	S5K15320.jpg
2016-12-10	00:45	Small ridge of massive pillow.	16.96583	144.86734	3276	160	S5K15390.jpg
2016-12-10	00:46	Small pit.	16.96581	144.86734	3277	170	2016-12-10T00_46_12.487745_S5K.jpg
2016-12-10	00:47	Still moving south through lava flows. A lot of massive pillows with some broken pieces.	16.96554	144.86734	3275	182	2016-12-10T00_47_37.508547_S5K.jpg
2016-12-10	00:48	Edge of a collapse or small fissure.	16.96553	144.86744	3275	182	2016-12-10T00_48_13.509204_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	00:49	Coming over a ridge and collapse.	16.96529	144.86745	3276	180	
2016-12-10	00:50	In a flat channel with sheet flow.	16.96518	144.86742	3277	182	S5K15644.jpg
2016-12-10	00:50	May be some sulfides on the surface of the sheet flow.	16.96527	144.86724	3280	182	2016-12-10T00_50_36.482059_S5K.jpg
2016-12-10	00:51	Small chimneys.	16.96526	144.86717	3281	181	
2016-12-10	00:51	Small line of tiny chimneys.	16.96530	144.86714	3281	177	2016-12-10T00_51_42.481497_S5K.jpg
2016-12-10	00:51	Chimneys but inactive.	16.96530	144.86714	3281	183	2016-12-10T00_51_55.497531_S5K.jpg
2016-12-10	00:52	Old venting.	16.96535	144.86717	3281	210	2016-12-10T00_52_48.485025_S5K.jpg
2016-12-10	00:53	No animals or any evidence of venting. Oxidized chimneys.	16.96539	144.86712	3282	184	S5K15845.jpg
2016-12-10	00:54	Will test a chimney to see how oxidized it is inside.	16.96537	144.86708	3284	178	2016-12-10T00_54_46.504975_S5K.jpg
2016-12-10	00:56	Shrimp behind.	16.96538	144.86707	3285	203	S5K16018.jpg
2016-12-10	00:57	Fell over.	16.96536	144.86710	3285	199	S5K16090.jpg
2016-12-10	00:59	Trying for another one.	16.96535	144.86713	3285	195	2016-12-10T00_59_12.500925_S5K.jpg
2016-12-10	01:00	Got a little piece of it.	16.96533	144.86713	3284	181	2016-12-10T01_00_42.494688_S5K.jpg
2016-12-10	01:01	Aft starboard of front biobox.	16.96533	144.86711	3285	181	1481331675736S5K16315.jpg
2016-12-10	01:01	S43-Geo-02 Piece of old altered chimney due S of the cone. South of WP 14. In sheet flows.	16.96533	144.86710	3285	183	S5K16339.jpg
2016-12-10	01:03	Shift change for the ROV crew.	16.96535	144.86710	3281	180	2016-12-10T01_03_52.505974_S5K.jpg
2016-12-10	01:05	In the channel of flat sheet flow as we head south.	16.96515	144.86710	3282	170	2016-12-10T01_05_47.496052_S5K.jpg
2016-12-10	01:06	Occasional hydrothermal deposits.	16.96493	144.86717	3281	162	1481331985982S5K16625.jpg
2016-12-10	01:06	Zooming quickly south.	16.96483	144.86720	3280	158	2016-12-10T01_06_45.519747_S5K.jpg
2016-12-10	01:07	Flat.	16.96458	144.86733	3282	152	2016-12-10T01_07_22.489753_S5K.jpg
2016-12-10	01:10	Heading for Alba Vent to the south but following sheet flow channel.	16.96406	144.86757	3280	171	S5K16873.jpg
2016-12-10	01:11	Bit of some relief.	16.96392	144.86758	3279	171	2016-12-10T01_11_01.502457_S5K.jpg
2016-12-10	01:12	Waiting a bit for the ship.	16.96380	144.86757	3280	170	2016-12-10T01_12_49.514615_S5K.jpg
2016-12-10	01:15	Continuing south.	16.96377	144.86758	3281	171	S5K17170.jpg
2016-12-10	01:15	Small hydrothermal deposit.	16.96373	144.86758	3281	171	2016-12-10T01_15_42.520600_S5K.jpg
2016-12-10	01:16	Moving out of channel into rougher flow.	16.96358	144.86760	3281	170	2016-12-10T01_16_19.495758_S5K.jpg
2016-12-10	01:18	Bottom got away from us.	16.96325	144.86763	3273	171	2016-12-10T01_18_04.491766_S5K.jpg
2016-12-10	01:18	10m off.	16.96319	144.86764	3274	170	S5K17343.jpg
2016-12-10	01:18	Back on the bottom.	16.96311	144.86766	3280	171	2016-12-10T01_18_52.510048_S5K.jpg
2016-12-10	01:19	That was a fish but no focus. Getting yanked by the tether.	16.96303	144.86767	3277	170	S5K17393.jpg
2016-12-10	01:20	Doing some ship and tether management.	16.96278	144.86775	3267	155	
2016-12-10	01:22	Back near the bottom.	16.96257	144.86761	3277	196	2016-12-10T01_22_43.508430_S5K.jpg
2016-12-10	01:24	About 140m from Alba.	16.96239	144.86760	3276	165	1481333039550S5K17679.jpg
2016-12-10	01:24	Fish.	16.96227	144.86764	3278	172	S5K17727.jpg
2016-12-10	01:26	Looks like some flat flows. Seeing squat lobsters.	16.96207	144.86760	3280	185	S5K17853.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	01:27	A bit of staining and flatter sheet flows.	16.96204	144.86758	3281	183	S5K17883.jpg
2016-12-10	01:28	Ship is yanking our tether so not many good photos with the autofocus.	16.96192	144.86759	3277	163	2016-12-10T01_28_03.532954_S5K.jpg
2016-12-10	01:28	Crack of white with squat lobsters.	16.96190	144.86761	3277	144	S5K17959.jpg
2016-12-10	01:29	White cracks with ha little venting. Anemones and mini chimneys.	16.96189	144.86762	3280	144	S5K17979.jpg
2016-12-10	01:29	Inactive chimneys with maybe a little venting.	16.96185	144.86767	3282	141	2016-12-10T01_29_34.528255_S5K.jpg
2016-12-10	01:30	Dead chimneys and some animals.	16.96183	144.86766	3281	125	1481333409707S5K18049.jpg
2016-12-10	01:30	Old flange on the chimney beyond.	16.96180	144.86765	3282	98	2016-12-10T01_30_33.522839_S5K.jpg
2016-12-10	01:31	Slight touchdown.	16.96181	144.86763	3281	94	2016-12-10T01_31_15.522648_S5K.jpg
2016-12-10	01:31	Looking east.	16.96181	144.86766	3280	96	S5K18142.jpg
2016-12-10	01:33	Old flange.	16.96185	144.86777	3281	170	S5K18240.jpg
2016-12-10	01:33	Took a view of these older chimneys before heading south to Alba.	16.96182	144.86776	3279	170	2016-12-10T01_33_48.502478_S5K.jpg
2016-12-10	01:34	Seeing milky fluid	16.96161	144.86776	3283	171	2016-12-10T01_34_46.530817_S5K.jpg
2016-12-10	01:35	Another patch of older chimneys.	16.96155	144.86776	3284	162	2016-12-10T01_35_12.524846_S5K.jpg
2016-12-10	01:35	Back on flat bottom.	16.96148	144.86782	3283	166	2016-12-10T01_35_41.520936_S5K.jpg
2016-12-10	01:35	More flow and chimney in front of us.	16.96144	144.86783	3282	160	2016-12-10T01_35_53.528829_S5K.jpg
2016-12-10	01:36	We are 20m from Alba so this looks like a different chimney.	16.96137	144.86783	3280	160	S5K18430.jpg
2016-12-10	01:36	Black smoke so maybe it is Alba as we get closer.	16.96133	144.86784	3277	155	S5K18458.jpg
2016-12-10	01:38	Getting a good view of Alba from the northwest side.	16.96128	144.86784	3277	121	S5K18547.jpg
2016-12-10	01:38	Sulfide block mound with chimneys on top.	16.96127	144.86785	3276	114	2016-12-10T01_38_48.512975_S5K.jpg
2016-12-10	01:41	Highlights on at 140 while we traverse Alba	16.96130	144.86790	3276	164	
2016-12-10	01:41	Circling around clockwise.	16.96130	144.86790	3276	174	S5K18714.jpg
2016-12-10	01:43	Circling back counter-clockwise after going half way around.	16.96120	144.86793	3274	297	2016-12-10T01_43_16.509674_S5K.jpg
2016-12-10	01:45	Highlights off	16.96126	144.86785	3275	100	
2016-12-10	01:45	Going to land in front of the black smokers facing E where can land on the lava.	16.96127	144.86785	3276	102	2016-12-10T01_45_06.520568_S5K.jpg
2016-12-10	01:48	Some snails on the chimneys in the background.	16.96128	144.86787	3277	104	2016-12-10T01_48_29.525058_S5K.jpg
2016-12-10	01:49	On the seafloor and having a look.	16.96127	144.86788	3277	105	S5K19231.jpg
2016-12-10	01:53	Looking for areas of diffuse flow to sample.	16.96121	144.86779	3277	103	2016-12-10T01_53_44.537042_S5K.jpg
2016-12-10	01:55	Checking temperature in this crack.	16.96124	144.86783	3277	99	2016-12-10T01_55_43.517508_S5K.jpg
2016-12-10	01:56	Only 4 deg C.	16.96124	144.86782	3277	101	2016-12-10T01_56_26.527318_S5K.jpg
2016-12-10	01:57	6deg down there...going up a little.	16.96128	144.86781	3277	102	2016-12-10T01_57_34.529748_S5K.jpg
2016-12-10	01:57	Up to 10 deg.	16.96130	144.86778	3277	102	S5K19718.jpg
2016-12-10	01:58	Crab got a shrimp.	16.96130	144.86776	3277	101	2016-12-10T01_58_14.537480_S5K.jpg
2016-12-10	01:59	Crab with shrimp in upper left.	16.96126	144.86777	3277	101	S5K19815.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	02:00	8deg and going up slowly.	16.96126	144.86778	3277	99	2016-12-10T02_00_19.531436_S5K.jpg
2016-12-10	02:01	Taking a sensor reading here.	16.96126	144.86779	3277	100	S5K19901.jpg
2016-12-10	02:02	highlights for Thom imagery	16.96125	144.86781	3277	99	2016-12-10T02_02_19.550999_S5K.jpg
2016-12-10	02:02	Temp=11.5 pH=6.28 O2=2.33 ml/l.	16.96125	144.86781	3277	99	2016-12-10T02_02_25.518941_S5K.jpg
2016-12-10	02:02	Temp still going up a bit here.	16.96126	144.86781	3277	101	2016-12-10T02_02_58.519052_S5K.jpg
2016-12-10	02:03	Turning off sensors.	16.96126	144.86782	3277	100	S5K20040.jpg
2016-12-10	02:03	Palm worms here.	16.96126	144.86782	3277	101	2016-12-10T02_03_32.531782_S5K.jpg
2016-12-10	02:04	S43-HFS-03 Start 02:04 Unfiltered Bag #16 Base of Alba Vent in a crack where the shimmering water is coming over. Can see some exhaust.	16.96126	144.86782	3277	101	2016-12-10T02_04_27.562454_S5K.jpg
2016-12-10	02:05	Pulled out of the crack.	16.96125	144.86783	3277	103	2016-12-10T02_05_51.541970_S5K.jpg
2016-12-10	02:06	Stopped. May try again here.	16.96126	144.86783	3277	103	
2016-12-10	02:07	Getting pulled off.	16.96127	144.86783	3277	105	
2016-12-10	02:07	Overview.	16.96128	144.86784	3277	102	2016-12-10T02_07_23.543367_S5K.jpg
2016-12-10	02:09	Trying for that v-shape in the rock (upside down V).	16.96131	144.86789	3278	101	2016-12-10T02_09_00.548532_S5K.jpg
2016-12-10	02:09	Peripheral rocks at base with Munidopsis, Neoverruca and Provanna along with stray shrimp and crabs.	16.96131	144.86789	3278	99	2016-12-10T02_09_10.520273_S5K.jpg
2016-12-10	02:11	Low smoking chimneys with small snail clusters, chorocaris and crab along with Paralvinella hessleri alvinellids.	16.96126	144.86788	3277	98	S5K20506.jpg
2016-12-10	02:11	Tiny shrimp in crack.	16.96125	144.86786	3277	98	2016-12-10T02_11_31.539499_S5K.jpg
2016-12-10	02:16	Back over to the original crack.	16.96121	144.86786	3277	101	S5K20808.jpg
2016-12-10	02:16	Not in view on science camera.	16.96120	144.86787	3277	102	
2016-12-10	02:17	Turned sampler back on again.	16.96121	144.86789	3277	100	2016-12-10T02_17_52.539683_S5K.jpg
2016-12-10	02:18	ROV is not stable here and wiggles out of the crevice.	16.96124	144.86788	3277	100	
2016-12-10	02:19	Not getting good exhaust. Stopping and starting again.	16.96125	144.86789	3277	100	S5K20980.jpg
2016-12-10	02:19	Seeing a little bit of flow in exhaust.	16.96127	144.86789	3277	100	2016-12-10T02_19_25.532601_S5K.jpg
2016-12-10	02:20	Seeing just a trickle of flow.	16.96127	144.86789	3277	100	2016-12-10T02_20_10.553530_S5K.jpg
2016-12-10	02:20	Highlights on.	16.96127	144.86789	3277	99	S5K21072.jpg
2016-12-10	02:21	Stop. Tmax=13.3 Tavg=9.6 vol=559 T2=4. Not a good sample.	16.96128	144.86789	3277	99	S5K21103.jpg
2016-12-10	02:27	7.5deg and going up a bit.	16.96129	144.86792	3277	97	2016-12-10T02_27_15.539357_S5K.jpg
2016-12-10	02:27	8.2°C here.	16.96129	144.86791	3277	96	2016-12-10T02_27_43.536376_S5K.jpg
2016-12-10	02:28	Trying the small hole under the snails.	16.96127	144.86791	3277	94	2016-12-10T02_28_33.552188_S5K.jpg
2016-12-10	02:29	Only 5.5deg in the hole.	16.96127	144.86791	3277	93	S5K21583.jpg
2016-12-10	02:30	Highlights off	16.96127	144.86790	3277	94	
2016-12-10	02:30	9.7deg against the wall.	16.96128	144.86789	3277	94	2016-12-10T02_30_40.541907_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	02:32	Another spot...11.5.....12.....	16.96127	144.86787	3277	93	2016-12-10T02_32_07.534638_S5K.jpg
2016-12-10	02:32	Got up to over 13°C.	16.96126	144.86786	3277	93	2016-12-10T02_32_53.545960_S5K.jpg
2016-12-10	02:35	HFS sensor reading in this spot.	16.96127	144.86788	3277	93	2016-12-10T02_35_20.557579_S5K.jpg
2016-12-10	02:36	Temp=14.6 pH=6.1 O2=1.86 at that location.	16.96126	144.86788	3277	93	2016-12-10T02_36_35.556962_S5K.jpg
2016-12-10	02:37	Sensor reading one record before this.	16.96126	144.86788	3277	93	
2016-12-10	02:37	Going to try for a hot sample instead.	16.96126	144.86788	3277	94	S5K22082.jpg
2016-12-10	02:38	Going to try here.	16.96126	144.86788	3277	93	S5K22120.jpg
2016-12-10	02:39	Sensors off.	16.96125	144.86787	3277	95	
2016-12-10	02:41	Larger hole now.	16.96126	144.86787	3277	87	2016-12-10T02_41_25.553877_S5K.jpg
2016-12-10	02:43	Sideways hole.	16.96127	144.86786	3277	90	2016-12-10T02_42_58.546174_S5K.jpg
2016-12-10	02:45	131deg and going up.	16.96127	144.86786	3277	88	1481337902681S5K22542.jpg
2016-12-10	02:45	S43-HFS-04 Start 02:45. Filtered Piston #1. Seeing some flow in the exhaust but not strong. Vent that was excavated slightly.	16.96127	144.86786	3277	88	2016-12-10T02_45_28.568287_S5K.jpg
2016-12-10	02:46	Highlights on	16.96127	144.86786	3277	88	
2016-12-10	02:48	Little black bug above the snail.	16.96127	144.86787	3277	88	2016-12-10T02_48_03.565687_S5K.jpg
2016-12-10	02:51	Stop. Tmax=209 Tavg=166 vol=650 T2=10. Flush pump in bursts and the sample stopped on its own with P1 sudden obstruction (a good sign).	16.96127	144.86788	3277	88	2016-12-10T02_51_17.547525_S5K.jpg
2016-12-10	02:53	S43-HFS-05 Start 02:53 Unfiltered Piston #2. Same location as HFS-04 on the lower part of Alba Vent. Running the flush pump on this one. Can see some exhaust flow.	16.96127	144.86787	3277	87	2016-12-10T02_53_32.546326_S5K.jpg
2016-12-10	02:56	Highlights on at 02:47 and off at 02:56	16.96127	144.86785	3277	87	
2016-12-10	02:56	Temperature came down when turned off the flush pump.	16.96127	144.86785	3277	87	S5K23258.jpg
2016-12-10	03:02	Stop. Tmax=219 Tavg=193 vol=625 T2=50.	16.96126	144.86786	3277	86	2016-12-10T03_02_01.546238_S5K.jpg
2016-12-10	03:04	S43-HFS-06 Start 03:04 Filtered Piston #3 Same exact location as the last two samples.	16.96125	144.86787	3277	86	2016-12-10T03_04_55.559459_S5K.jpg
2016-12-10	03:07	Turned flush pump on again.	16.96125	144.86787	3277	86	2016-12-10T03_07_09.565646_S5K.jpg
2016-12-10	03:09	Stopped the flush pump when nozzle moved.	16.96125	144.86786	3277	85	S5K24015.jpg
2016-12-10	03:10	Turning the pump back on.	16.96126	144.86787	3277	85	2016-12-10T03_10_33.576637_S5K.jpg
2016-12-10	03:13	Stop. Tmax=238.6 Tavg=120 vol=800 T2=50.	16.96132	144.86786	3277	85	S5K24256.jpg
2016-12-10	03:14	Gauge reading.	16.96131	144.86786	3277	85	2016-12-10T03_14_15.547414_S5K.jpg
2016-12-10	03:14	Done with water sampling here but may try a gas sample.	16.96131	144.86786	3277	85	
2016-12-10	03:16	Putting HFS away.	16.96126	144.86787	3277	84	2016-12-10T03_16_21.581877_S5K.jpg
2016-12-10	03:18	Done.	16.96122	144.86789	3278	82	2016-12-10T03_18_53.562271_S5K.jpg
2016-12-10	03:20	Going to try and get the gastight.	16.96126	144.86788	3278	77	S5K24698.jpg
2016-12-10	03:25	Retrieved the gas tight bottle from the milk crate.	16.96128	144.86788	3278	80	2016-12-10T03_25_58.593595_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	03:26	Not a good fit with the ram.	16.96128	144.86788	3278	81	2016-12-10T03_26_33.566321_S5K.jpg
2016-12-10	03:27	Looks extended further than before.	16.96128	144.86788	3278	75	2016-12-10T03_26_56.590942_S5K.jpg
2016-12-10	03:30	Decided not to use this gastight.	16.96130	144.86787	3278	75	S5K25253.jpg
2016-12-10	03:31	Stowing the sampler.	16.96130	144.86788	3278	75	2016-12-10T03_31_13.569700_S5K.jpg
2016-12-10	03:32	The ram had come up and on a bottle up here on the surface, that should easily go down to the level of the o-ring. Could gently move the ram and it should slide down without firing.	16.96131	144.86786	3278	75	S5K25398.jpg
2016-12-10	03:34	Testing the port arm which was having an issue.	16.96130	144.86784	3278	73	2016-12-10T03_34_31.572998_S5K.jpg
2016-12-10	03:35	Doing a reset on the port arm.	16.96129	144.86784	3278	72	
2016-12-10	03:38	Looks like the o-ring is at the edge of the bottle.	16.96127	144.86785	3278	71	2016-12-10T03_38_25.580476_S5K.jpg
2016-12-10	03:39	Need to get the gastight back in the other arm.	16.96125	144.86785	3278	67	S5K25835.jpg
2016-12-10	03:40	Feel on the side of the crate.	16.96126	144.86785	3278	68	S5K25889.jpg
2016-12-10	03:41	Looks like the marker pulled the ram back out.	16.96126	144.86785	3278	68	2016-12-10T03_41_43.567138_S5K.jpg
2016-12-10	03:46	Got the gastight! Whew!	16.96126	144.86786	3278	68	2016-12-10T03_46_54.586250_S5K.jpg
2016-12-10	03:46	Getting the gastight in the correct configuration.	16.96126	144.86786	3278	68	2016-12-10T03_46_54.586250_S5K.jpg
2016-12-10	03:49	Successful transfer.	16.96126	144.86787	3278	67	2016-12-10T03_49_23.602043_S5K.jpg
2016-12-10	03:49	Just fits.	16.96126	144.86787	3278	68	2016-12-10T03_49_52.601259_S5K.jpg
2016-12-10	03:50	Ready to sample.	16.96127	144.86787	3278	68	2016-12-10T03_50_12.579804_S5K.jpg
2016-12-10	03:50	Eel!	16.96127	144.86787	3278	65	S5K26477.jpg
2016-12-10	03:51	Got a couple of images of the eel.	16.96127	144.86787	3278	66	
2016-12-10	03:53	Doing a slight repositioning of the ROV to reach the black smoker.	16.96127	144.86786	3278	67	2016-12-10T03_53_04.581581_S5K.jpg
2016-12-10	03:55	Looks like a good position.	16.96128	144.86785	3278	89	S5K26763.jpg
2016-12-10	03:56	Good angle.	16.96127	144.86785	3278	89	2016-12-10T03_56_11.607707_S5K.jpg
2016-12-10	04:01	S43-GTB-07 Fired. In the black smoke in the smoker in the back of the small chimney in front. When fired saw the wand go further in the orifice. Same hole as the HFS samples here but at a slightly different angle.	16.96124	144.86785	3278	89	
2016-12-10	04:03	Great sample.	16.96126	144.86785	3278	89	
2016-12-10	04:03	Need to put the sampler back in the crate.	16.96126	144.86785	3278	88	2016-12-10T04_03_31.612650_S5K.jpg
2016-12-10	04:03	Next will want to take a sulfide sample of a chimney here.	16.96126	144.86786	3278	89	S5K27269.jpg
2016-12-10	04:06	Sampler is in the crate.	16.96125	144.86786	3278	88	
2016-12-10	04:07	Going to try to use a scoop and manipulator to get a chimney.	16.96126	144.86786	3278	88	
2016-12-10	04:09	Using the net instead of the scoop as the latter is too short.	16.96126	144.86786	3278	85	
2016-12-10	04:12	Got the net.	16.96126	144.86785	3278	82	1481343123834S5K27763.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	04:12	Want a sulfide that has black smoke coming out of it.	16.96126	144.86785	3278	83	2016-12-10T04_12_27.605529_S5K.jpg
2016-12-10	04:13	Good one there.	16.96126	144.86785	3278	84	2016-12-10T04_13_50.593401_S5K.jpg
2016-12-10	04:15	That piece bounced off the rim of the net.	16.96128	144.86786	3278	82	2016-12-10T04_15_06.597605_S5K.jpg
2016-12-10	04:17	Some tiny pieces came off that chimney but going for a bigger piece.	16.96125	144.86786	3278	82	S5K28094.jpg
2016-12-10	04:20	Back up as the vehicle is moving.	16.96125	144.86785	3277	84	
2016-12-10	04:20	S43-Geo-08 Sulfide sample of the black smokers in the same area that HFS and gastights taken.	16.96125	144.86783	3278	92	S5K28287.jpg
2016-12-10	04:22	Pieces of chimney fell into net after claw excavated in two places.	16.96126	144.86784	3276	95	
2016-12-10	04:22	Placed in stbd side of aft biobox.	16.96126	144.86782	3277	98	S5K28413.jpg
2016-12-10	04:23	Next will try to take some microbiology samples with the Beast.	16.96125	144.86781	3277	97	
2016-12-10	04:24	Looking for diffuse flow on Alba.	16.96124	144.86781	3274	97	
2016-12-10	04:24	Looking for a stable landing spot to sample for an hour.	16.96123	144.86785	3275	98	S5K28524.jpg
2016-12-10	04:27	Looking for water over 20°C.	16.96126	144.86786	3277	101	2016-12-10T04_27_57.603504_S5K.jpg
2016-12-10	04:29	That was where the chimney broke.	16.96129	144.86783	3277	98	2016-12-10T04_29_56.629395_S5K.jpg
2016-12-10	04:30	S43-HFS-09 Start 04:30 LVB #24. In diffuse flow just below the black smokers sampled near the base of Alba Vent. See exhaust.	16.96131	144.86782	3277	99	S5K28889.jpg
2016-12-10	04:32	Sample takes about 30 minutes so will take some biology video at the same time.	16.96132	144.86784	3277	97	2016-12-10T04_32_50.584653_S5K.jpg
2016-12-10	04:33	Temperature is about 14°C at the moment.	16.96131	144.86786	3277	97	2016-12-10T04_33_53.609716_S5K.jpg
2016-12-10	04:34	Lasers on.	16.96130	144.86787	3277	97	S5K29106.jpg
2016-12-10	04:36	Steady temperature of 15°C.	16.96128	144.86790	3277	97	S5K29209.jpg
2016-12-10	04:47	Overview of sampling site.	16.96127	144.86786	3277	96	S5K29904.jpg
2016-12-10	04:49	Scaleworm.	16.96129	144.86786	3277	96	2016-12-10T04_49_16.612005_S5K.jpg
2016-12-10	04:51	Barnacles, scale worms, limpets, shrimp and crabs.	16.96127	144.86785	3277	96	S5K30113.jpg
2016-12-10	04:53	Stop. Tmax=16.3 Tavg=14.7 vol=3200ml T2=8.	16.96124	144.86784	3277	96	
2016-12-10	04:54	S43-HFS-10 Start 04:54 RNA Filter #10 Same location as LVB HFS-09.	16.96122	144.86785	3277	96	S5K30330.jpg
2016-12-10	05:03	Lots of bacteria coating the carapace.	16.96128	144.86786	3277	94	2016-12-10T05_03_46.610261_S5K.jpg
2016-12-10	05:04	Probably a sick crab.	16.96128	144.86785	3277	94	S5K30883.jpg
2016-12-10	05:04	Or sick squat lobster.	16.96128	144.86786	3277	94	2016-12-10T05_04_45.636411_S5K.jpg
2016-12-10	05:21	Stop. Tmax=16.4 Tavg=14.1 vol=3002 T2=8.	16.96122	144.86788	3277	93	S5K31915.jpg
2016-12-10	05:24	S43-HFS-11 Start 05:24 Unfiltered Bag #22 At the same site as the LVB sample on Alba Vent.	16.96126	144.86786	3277	93	2016-12-10T05_24_48.630237_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	05:27	Stop. Tmax=16.7 Tavg=16 vol=401 T2=8	16.96126	144.86785	3277	94	
2016-12-10	05:28	S43-HFS-12 Start 05:28 Filtered Bag #21. Same exact location as HFS-13 and LVB.	16.96126	144.86785	3277	94	2016-12-10T05_28_11.616844_S5K.jpg
2016-12-10	05:30	Sampler working well. Good exhaust.	16.96128	144.86785	3277	93	2016-12-10T05_30_34.639382_S5K.jpg
2016-12-10	05:30	Stop. Tmax=16.6 Tavg=15.5 T2=9 vol=403	16.96128	144.86785	3277	93	
2016-12-10	05:31	S42-HFS-13 Start 05:31 Unfiltered Bag #20 Same exact location as LVB and previous HFS sample.	16.96126	144.86785	3277	93	2016-12-10T05_31_40.637732_S5K.jpg
2016-12-10	05:34	Stop. Tmax=16.1 Tavg=15.4 T2=8.5 vol=401ml/l.	16.96126	144.86786	3277	93	S5K32692.jpg
2016-12-10	05:34	Taking HFS sensor readings. (Port 12)	16.96125	144.86786	3277	93	2016-12-10T05_34_43.602946_S5K.jpg
2016-12-10	05:35	Today so far the HFS has pumped 27 liters of water.	16.96124	144.86787	3277	93	2016-12-10T05_35_37.618070_S5K.jpg
2016-12-10	05:40	O2=1.84 pH=6.05 Temp=15 Sensors at this site.	16.96126	144.86787	3277	93	2016-12-10T05_40_55.629268_S5K.jpg
2016-12-10	05:41	Turning of the flush pumps.	16.96126	144.86788	3277	93	S5K33145.jpg
2016-12-10	05:43	Stowing the wand.	16.96126	144.86787	3277	89	2016-12-10T05_43_22.637100_S5K.jpg
2016-12-10	05:44	Cleaning out the lines of the HFS by pumping some seawater.	16.96125	144.86787	3277	87	
2016-12-10	05:45	Next will retrieve the puck from the basket.	16.96124	144.86786	3277	90	
2016-12-10	05:46	SPME is the puck.	16.96124	144.86786	3277	84	
2016-12-10	05:48	Retrieving the SPME puck out of the forward biobox.	16.96127	144.86785	3277	85	2016-12-10T05_48_30.646348_S5K.jpg
2016-12-10	05:51	Holding down the biobox down with the stbd arm to pull this out with the port arm.	16.96127	144.86785	3277	83	2016-12-10T05_51_01.626399_S5K.jpg
2016-12-10	05:52	This is SPME #4.	16.96128	144.86786	3277	82	S5K33789.jpg
2016-12-10	06:11	Good grip.	16.96128	144.86789	3277	71	2016-12-10T06_11_14.666261_S5K.jpg
2016-12-10	06:12	Got it in position.	16.96127	144.86789	3277	66	S5K34961.jpg
2016-12-10	06:13	Was not square in the claw and slipped.	16.96127	144.86788	3277	64	2016-12-10T06_13_41.671927_S5K.jpg
2016-12-10	06:13	Try it again.	16.96127	144.86788	3277	64	S5K35076.jpg
2016-12-10	06:16	Getting another grip on the sampler.	16.96126	144.86788	3277	64	2016-12-10T06_16_29.678564_S5K.jpg
2016-12-10	06:18	Going to place the puck in the diffuse flow where the LVB was taken.	16.96125	144.86788	3277	64	2016-12-10T06_17_59.669205_S5K.jpg
2016-12-10	06:19	S43-Bio-14 SPME #4 Puck squeezing in the diffuse flow of the LVB sample at Able Vent.	16.96126	144.86787	3277	64	
2016-12-10	06:20	Highlights on	16.96125	144.86787	3277	64	
2016-12-10	06:20	The puck stays in the flow for 10 minutes while squeezed.	16.96125	144.86787	3277	64	
2016-12-10	06:23	Looks like the rope side of the puck is facing toward the outside of the flow away from the chimney.	16.96126	144.86788	3277	64	2016-12-10T06_23_20.694085_S5K.jpg
2016-12-10	06:24	Highlights off	16.96126	144.86788	3277	64	
2016-12-10	06:32	Done squeezing and ready to retrieve.	16.96127	144.86786	3277	64	2016-12-10T06_32_00.704300_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	06:32	Placing the puck back into the forward-stbd quarter of the biobox.	16.96126	144.86787	3277	64	2016-12-10T06_32_33.701194_S5K.jpg
2016-12-10	06:33	Done sampling at Alba Vent for today.	16.96126	144.86787	3277	64	2016-12-10T06_33_25.718518_S5K.jpg
2016-12-10	06:34	Going to turn to the west to head for Sequoia Chimney at waypoint #2. Turning clockwise.	16.96133	144.86780	3275	27	
2016-12-10	06:36	Moving west flying above the bottom.	16.96126	144.86758	3279	241	
2016-12-10	06:36	Can see Sequoia on the sonar already.	16.96118	144.86729	3279	266	S5K36457.jpg
2016-12-10	06:37	Seeing the base of Sequoia.	16.96122	144.86714	3281	276	2016-12-10T06_37_49.698535_S5K.jpg
2016-12-10	06:39	Will attempt a video survey from bottom to top.	16.96132	144.86714	3284	320	
2016-12-10	06:39	Different type of fish	16.96135	144.86714	3284	303	2016-12-10T06_39_45.684464_S5K.jpg
2016-12-10	06:40	Having to nudge the sampling sled back in with the stbd arm.	16.96134	144.86711	3283	282	S5K36648.jpg
2016-12-10	06:42	There is the marker that we let go from above on an earlier dive.	16.96130	144.86698	3278	210	2016-12-10T06_41_54.682222_S5K.jpg
2016-12-10	06:42	Marker 254 Mkr-254!	16.96122	144.86691	3280	110	2016-12-10T06_42_43.692866_S5K.jpg
2016-12-10	06:43	Lovely photos of the marker!	16.96122	144.86693	3282	123	S5K36851.jpg
2016-12-10	06:43	The anchor of Mkr-254.	16.96123	144.86693	3282	144	2016-12-10T06_44_07.676877_S5K.jpg
2016-12-10	06:44	Marker is on the base of Sequoia at 145 deg of heading in old blocks of sulfides and squat lobsters.	16.96122	144.86693	3281	146	S5K36905.jpg
2016-12-10	06:45	Going to start on the north side of Sequoia and moving up.	16.96123	144.86695	3279	166	2016-12-10T06_45_18.683886_S5K.jpg
2016-12-10	06:46	Highlights on for biological survey of Sequoia chimney.	16.96122	144.86695	3277	177	2016-12-10T06_46_19.715330_S5K.jpg
2016-12-10	07:04	Highlights off.	16.96121	144.86699	3260	203	S5K38113.jpg
2016-12-10	07:05	Moving around to look at the west face of Sequoia. Just finished the north face video survey.	16.96118	144.86688	3265	132	
2016-12-10	07:09	Going to start the west face from the dark area near the base.	16.96114	144.86688	3279	95	2016-12-10T07_08_59.723273_S5K.jpg
2016-12-10	07:09	Highlights on 2nd pass, bio survey of Sequoia.	16.96114	144.86689	3277	98	2016-12-10T07_09_43.748045_S5K.jpg
2016-12-10	07:21	We have MAPR data coming in live.	16.96114	144.86696	3260	105	2016-12-10T07_21_04.770183_S5K.jpg
2016-12-10	07:23	Highlights off.	16.96115	144.86695	3255	131	2016-12-10T07_23_26.720674_S5K.jpg
2016-12-10	07:24	Spinning around the top to come down to the base and video another side of this chimney.	16.96114	144.86704	3255	243	2016-12-10T07_24_04.731093_S5K.jpg
2016-12-10	07:26	Starting at the base looking at the east side of the chimney.	16.96112	144.86705	3277	274	2016-12-10T07_26_25.752284_S5K.jpg
2016-12-10	07:27	Heading up Sequoia again. Looking at the east face.	16.96112	144.86704	3277	274	2016-12-10T07_27_39.773444_S5K.jpg
2016-12-10	07:28	Highlights on, 3rd pass biological survey of Sequoia.	16.96112	144.86706	3274	275	2016-12-10T07_28_34.769262_S5K.jpg

Date	Time	S43 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-10	07:29	Nice little chimney.	16.96112	144.86704	3271	274	2016-12-10T07_29_53.771683_S5K.jpg
2016-12-10	07:30	Moving on up the east side.	16.96112	144.86704	3271	272	2016-12-10T07_30_14.756268_S5K.jpg
2016-12-10	07:32	Limpet land.	16.96112	144.86701	3266	273	2016-12-10T07_32_08.765668_S5K.jpg
2016-12-10	07:32	Shrimp zone.	16.96112	144.86701	3265	276	S5K39781.jpg
2016-12-10	07:37	Coming to the top of the east side of Sequoia.	16.96111	144.86702	3255	272	S5K40067.jpg
2016-12-10	07:37	Shrimp on top.	16.96111	144.86701	3254	272	2016-12-10T07_37_44.767308_S5K.jpg
2016-12-10	07:37	Done with the east side of the chimney.	16.96111	144.86701	3254	273	2016-12-10T07_37_56.777151_S5K.jpg
2016-12-10	07:38	Completed 3 sides of Sequoia for video survey. Did not do the south side.	16.96111	144.86701	3254	271	2016-12-10T07_38_16.785367_S5K.jpg
2016-12-10	07:38	Highlights off.	16.96111	144.86702	3253	272	2016-12-10T07_38_26.764673_S5K.jpg
2016-12-10	07:38	Coming off bottom.	16.96112	144.86703	3252	271	

Table 6.6-10 Dive S44 – Hafa Adai

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	01:29:34	Bottom is in site.	16.96059	144.87227	3276	107	2016-12-11T01_29_34.688316_S5K.jpg
2016-12-11	01:29:47	Looks like a pile of lava an a piece of hydrothermal material.	16.96059	144.87229	3279	107	S5K07796.jpg
2016-12-11	01:29:59	HD recording on.	16.96059	144.87230	3279	106	2016-12-11T01_29_58.678214_S5K.jpg
2016-12-11	01:30:29	Looking to the east. Lots of sediment.	16.96060	144.87233	3281	107	2016-12-11T01_30_28.708880_S5K.jpg
2016-12-11	01:30:45	Old chimney	16.96061	144.87235	3282	107	2016-12-11T01_30_45.689240_S5K.jpg
2016-12-11	01:31:02	Passed a little chimney (dead).	16.96061	144.87238	3280	107	S5K07863.jpg
2016-12-11	01:31:19	Sulfide mound on right?	16.96062	144.87240	3280	107	2016-12-11T01_31_17.691475_S5K.jpg
2016-12-11	01:31:21	Flat flow with sediment and some hydrothermal staining. Not many animals.	16.96062	144.87240	3280	107	2016-12-11T01_31_20.696092_S5K.jpg
2016-12-11	01:32:04	Old chimneys	16.96065	144.87238	3281	106	2016-12-11T01_32_03.707139_S5K.jpg
2016-12-11	01:32:06	Some old sulfides.	16.96065	144.87237	3281	105	2016-12-11T01_32_05.710948_S5K.jpg
2016-12-11	01:33:03	Red shrimp.	16.96070	144.87234	3281	100	2016-12-11T01_33_01.701007_S5K.jpg
2016-12-11	01:33:15	Not seeing any squat lobsters or anemones. Old-looking rocks and older sulfides.	16.96072	144.87234	3282	98	2016-12-11T01_33_14.717332_S5K.jpg
2016-12-11	01:33:47	Bright-colored pelagic shrimp.	16.96073	144.87234	3283	102	2016-12-11T01_33_46.729693_S5K.jpg
2016-12-11	01:34:10	Looking to pickup rock.	16.96074	144.87233	3283	92	2016-12-11T01_34_09.715510_S5K.jpg
2016-12-11	01:34:50	Rock breaking apart in the jaws so will try another one.	16.96075	144.87233	3283	90	2016-12-11T01_34_47.721750_S5K.jpg
2016-12-11	01:36:14	S44-Geo-01 Big lava rock taken south of waypoint #9 upon arriving on the seafloor at Hafa Adai. Looks like about 20m due south of waypoint. Older lavas with some sulfides.	16.96076	144.87231	3284	94	2016-12-11T01_36_13.698353_S5K.jpg
2016-12-11	01:37:56	Looks like old chimneys with no smoke.	16.96095	144.87219	3281	254	2016-12-11T01_37_55.688913_S5K.jpg
2016-12-11	01:38:12	Chimneys, any venting?	16.96101	144.87215	3281	223	S5K08301.jpg
2016-12-11	01:38:46	The waypoint #9 site chimneys.	16.96112	144.87208	3281	204	2016-12-11T01_38_45.701163_S5K.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	01:39:03	This one is old but see white patches beyond.	16.96117	144.87205	3281	190	2016-12-11T01_39_02.690782_S5K.jpg
2016-12-11	01:39:18	Looking due south at this old chimney and there are no animals.	16.96122	144.87203	3281	183	2016-12-11T01_39_17.705155_S5K.jpg
2016-12-11	01:39:37	Animals beyond this chimney toward the white staining area. Squat lobsters.	16.96125	144.87200	3282	183	S5K08386.jpg
2016-12-11	01:40:05	Taking a look at the older chimney first.	16.96131	144.87195	3281	167	1481420404788S5K08414.jpg
2016-12-11	01:40:38	Blue color may be microbial filaments.	16.96130	144.87198	3281	140	2016-12-11T01_40_36.679155_S5K.jpg
2016-12-11	01:41:16	Lots of squat lobsters at the base and a few up on the chimney.	16.96092	144.87199	3280	104	2016-12-11T01_41_15.700874_S5K.jpg
2016-12-11	01:42:06	Shimmering water behind on the other chimney.	16.96090	144.87202	3281	97	S5K08535.jpg
2016-12-11	01:42:29	Looking east now at the structure with some shimmer.	16.96088	144.87201	3280	98	2016-12-11T01_42_28.708092_S5K.jpg
2016-12-11	01:42:50	White looks like sulfur.	16.96087	144.87201	3281	98	2016-12-11T01_42_47.731536_S5K.jpg
2016-12-11	01:42:52	White patch.	16.96087	144.87201	3281	98	S5K08581.jpg
2016-12-11	01:43:12	Seeing some anemones in addition to the squat lobsters.	16.96087	144.87201	3281	100	2016-12-11T01_43_11.721277_S5K.jpg
2016-12-11	01:43:36	Shimmering water.	16.96086	144.87201	3281	115	2016-12-11T01_43_35.716084_S5K.jpg
2016-12-11	01:43:58	Also a few crabs.	16.96087	144.87201	3280	133	2016-12-11T01_43_57.707946_S5K.jpg
2016-12-11	01:44:44	See milky fluids coming from these structures.	16.96087	144.87200	3280	134	2016-12-11T01_44_43.705858_S5K.jpg
2016-12-11	01:45:21	A few shrimp and a dark crab.	16.96086	144.87199	3281	134	S5K08730.jpg
2016-12-11	01:45:28	Highlights on at WP 9, different terrace structures.	16.96086	144.87199	3281	134	2016-12-11T01_45_27.740131_S5K.jpg
2016-12-11	01:46:46	Looks like the current is moving away and to the left. At our heading that would be to the east.	16.96086	144.87200	3279	160	S5K08815.jpg
2016-12-11	01:47:53	Looking for a place to sample warm water.	16.96087	144.87201	3278	168	S5K08882.jpg
2016-12-11	01:48:34	Finding a place to land and sample.	16.96086	144.87203	3279	185	S5K08923.jpg
2016-12-11	01:49:14	Highlights off.	16.96085	144.87201	3279	159	2016-12-11T01_49_13.709260_S5K.jpg
2016-12-11	01:53:10	Sampling site for HFS.	16.96084	144.87202	3283	139	2016-12-11T01_53_08.727455_S5K.jpg
2016-12-11	01:55:13	Searching for fluid sampling spot	16.96086	144.87199	3283	140	S5K09321.jpg
2016-12-11	01:57:29	7deg C -	16.96085	144.87199	3284	140	S5K09458.jpg
2016-12-11	01:57:56	Move a bit: 4deg.	16.96085	144.87199	3284	140	2016-12-11T01_57_54.754154_S5K.jpg
2016-12-11	01:59:14	Diffuse flow around a large rock but no focused flow; 9°C.	16.96083	144.87198	3284	140	2016-12-11T01_59_12.727931_S5K.jpg
2016-12-11	02:01:03	12°C max here.	16.96082	144.87198	3284	140	2016-12-11T02_01_01.741188_S5K.jpg
2016-12-11	02:04:10	Maneuvering to get sub stable.	16.96084	144.87202	3285	139	2016-12-11T02_04_08.749797_S5K.jpg
2016-12-11	02:05:59	Not much there. 3deg and going up.	16.96084	144.87204	3285	140	S5K09967.jpg
2016-12-11	02:06:33	Getting closer to the rock. 4deg...	16.96084	144.87205	3285	140	S5K10002.jpg
2016-12-11	02:07:04	6.3deg....slowing down and coming down.	16.96084	144.87205	3285	140	2016-12-11T02_07_03.723163_S5K.jpg
2016-12-11	02:08:06	Lights!	16.96083	144.87205	3285	138	2016-12-11T02_08_05.731717_S5K.jpg
2016-12-11	02:08:40	Only 4deg there.	16.96083	144.87204	3285	139	2016-12-11T02_08_38.731745_S5K.jpg
2016-12-11	02:09:38	Looking better.	16.96084	144.87203	3285	138	S5K10187.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	02:11:21	S44-HFS-02 Unfiltered Piston #2 with good exhaust. Near Waypoint #9 20m Mami wata Vent (Water goddess)	16.96084	144.87199	3285	137	
2016-12-11	02:12:56	Stopped pump when wand slipped.	16.96086	144.87201	3285	137	S5K10385.jpg
2016-12-11	02:15:31	Trying to get back in the flow where it was before.	16.96087	144.87203	3285	139	1481422539144S5K10548.jpg
2016-12-11	02:16:38	Turned pump back on.	16.96086	144.87204	3285	139	S5K10607.jpg
2016-12-11	02:17:14	Exhaust looks really good.	16.96085	144.87204	3285	139	2016-12-11T02_17_13.759123_S5K.jpg
2016-12-11	02:17:37	Stopped the pump again.	16.96085	144.87205	3285	139	2016-12-11T02_17_36.745559_S5K.jpg
2016-12-11	02:19:19	Stop Tmax=13.3 Tavg=7.6 vol=393 ml T2=5.	16.96084	144.87205	3285	139	1481422758950S5K10768.jpg
2016-12-11	02:21:19	Want to stow the wand and look around with the camera.	16.96085	144.87204	3285	139	
2016-12-11	02:22:28	Stowing the wand.	16.96088	144.87204	3285	139	1481422947997S5K10957.jpg
2016-12-11	02:23:39	Doing a camera survey of this site.	16.96087	144.87203	3285	139	2016-12-11T02_23_38.767802_S5K.jpg
2016-12-11	02:24:20	Highlights on	16.96088	144.87203	3285	139	
2016-12-11	02:24:33	Limpets, scaleworm and trying to figure out what the filaments are.	16.96088	144.87203	3285	140	2016-12-11T02_24_32.766528_S5K.jpg
2016-12-11	02:25:17	Could just be microbiology.	16.96088	144.87202	3285	140	2016-12-11T02_25_16.781231_S5K.jpg
2016-12-11	02:26:39	Sulfide worms and scaleworms.	16.96086	144.87202	3285	140	2016-12-11T02_26_38.764679_S5K.jpg
2016-12-11	02:28:28	Done with scan.	16.96085	144.87199	3285	140	2016-12-11T02_28_27.747629_S5K.jpg
2016-12-11	02:28:29	Highlights off	16.96085	144.87199	3285	140	
2016-12-11	02:30:09	Coming off the bottom.	16.96085	144.87199	3285	139	2016-12-11T02_30_08.753389_S5K.jpg
2016-12-11	02:31:28	Some chimneys to the left which we saw when coming upon this site.	16.96091	144.87201	3280	97	2016-12-11T02_31_25.765625_S5K.jpg
2016-12-11	02:32:24	Stowing the wand while twirling above Mami wata.	16.96091	144.87208	3279	50	1481423541791S5K11551.jpg
2016-12-11	02:33:42	Older sulfides.	16.96089	144.87207	3283	79	2016-12-11T02_33_41.768316_S5K.jpg
2016-12-11	02:34:54	Wand slipped out.	16.96090	144.87207	3284	82	
2016-12-11	02:38:58	Taking a quick look at this white patch.	16.96088	144.87205	3280	56	1481423938199S5K11947.jpg
2016-12-11	02:40:10	Molten?	16.96088	144.87205	3282	85	2016-12-11T02_40_08.773480_S5K.jpg
2016-12-11	02:40:32	Highlights on	16.96089	144.87205	3282	87	
2016-12-11	02:40:51	Off to waypoint #7.	16.96088	144.87205	3282	84	2016-12-11T02_40_50.764005_S5K.jpg
2016-12-11	02:41:01	Highlights off	16.96089	144.87206	3280	68	
2016-12-11	02:41:07	Turning to port.	16.96089	144.87206	3280	48	1481424066964S5K12076.jpg
2016-12-11	02:41:26	Now turning stbd to get rid of wraps.	16.96090	144.87206	3279	141	2016-12-11T02_41_25.765761_S5K.jpg
2016-12-11	02:41:52	More chimneys beyond where we sampled with white diffuse flow.	16.96088	144.87201	3279	239	2016-12-11T02_41_49.759102_S5K.jpg
2016-12-11	02:42:14	Looking west now.	16.96090	144.87198	3280	267	1481424134275S5K12143.jpg
2016-12-11	02:42:32	Flat.	16.96091	144.87195	3281	267	2016-12-11T02_42_31.772826_S5K.jpg
2016-12-11	02:42:45	Flat with little sulfides.	16.96092	144.87190	3281	271	2016-12-11T02_42_44.783106_S5K.jpg
2016-12-11	02:43:09	Chimneys.	16.96094	144.87180	3281	273	2016-12-11T02_43_09.772828_S5K.jpg
2016-12-11	02:43:50	Quite a bit of sulfide deposits.	16.96101	144.87166	3279	270	2016-12-11T02_43_49.779472_S5K.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	02:44:16	Old chimney to the left.	16.96103	144.87156	3279	265	2016-12-11T02_44_13.772871_S5K.jpg
2016-12-11	02:44:27	Old chimneys.	16.96104	144.87152	3280	261	2016-12-11T02_44_25.789600_S5K.jpg
2016-12-11	02:44:46	Dead chimneys between waypoints 8 & 9.	16.96106	144.87146	3279	272	2016-12-11T02_44_45.775452_S5K.jpg
2016-12-11	02:45:14	Scanning side-to-side while heading west over old chimneys in the lava.	16.96104	144.87142	3275	239	2016-12-11T02_45_13.762891_S5K.jpg
2016-12-11	02:45:49	Too high to see.	16.96092	144.87131	3275	254	
2016-12-11	02:46:05	Coming back down.	16.96087	144.87128	3276	257	2016-12-11T02_46_04.782239_S5K.jpg
2016-12-11	02:46:26	Looks like just lava.	16.96083	144.87122	3278	275	1481424386216S5K12395.jpg
2016-12-11	02:46:48	Coming along with the ship.	16.96084	144.87113	3278	273	2016-12-11T02_46_45.791759_S5K.jpg
2016-12-11	02:47:03	Lava with a jumbled flow.	16.96084	144.87107	3279	276	2016-12-11T02_47_03.772095_S5K.jpg
2016-12-11	02:47:22	Little pit.	16.96083	144.87098	3279	270	2016-12-11T02_47_21.760711_S5K.jpg
2016-12-11	02:47:52	Little hydrothermal deposits.	16.96080	144.87080	3278	256	1481424472088S5K12481.jpg
2016-12-11	02:48:23	Some bright white patch ahead.	16.96078	144.87065	3276	264	1481424502960S5K12512.jpg
2016-12-11	02:49:04	Could be where we sampled the white snail.	16.96076	144.87054	3278	277	1481424544118S5K12553.jpg
2016-12-11	02:49:26	Another chimney in the background.	16.96073	144.87050	3279	296	2016-12-11T02_49_25.783091_S5K.jpg
2016-12-11	02:49:45	Pagoda like the flanges without the spires.	16.96075	144.87046	3280	273	2016-12-11T02_49_44.774225_S5K.jpg
2016-12-11	02:50:40	Where the chimney was taken off the top as well.	16.96074	144.87045	3280	276	2016-12-11T02_50_33.791734_S5K.jpg
2016-12-11	02:50:56	Squat lobsters, shrimp, limpets, crab, anemones, white snails.	16.96076	144.87046	3280	249	2016-12-11T02_50_55.786615_S5K.jpg
2016-12-11	02:51:01	Highlights, survey WP 7 area.	16.96076	144.87045	3280	246	2016-12-11T02_51_00.789773_S5K.jpg
2016-12-11	02:51:44	Going to head over to the bigger chimney to the north.	16.96076	144.87045	3281	243	2016-12-11T02_51_43.786494_S5K.jpg
2016-12-11	02:52:08	Can see some milky flow.	16.96078	144.87045	3281	267	2016-12-11T02_52_01.764649_S5K.jpg
2016-12-11	02:52:29	More broad and squat than the first and there is a larger one behind.	16.96083	144.87041	3281	292	2016-12-11T02_52_28.760481_S5K.jpg
2016-12-11	02:53:08	Going to check out the bigger one.	16.96089	144.87042	3281	288	2016-12-11T02_53_07.765126_S5K.jpg
2016-12-11	02:53:20	Big one!	16.96092	144.87041	3280	302	1481424800160S5K12809.jpg
2016-12-11	02:53:31	Past their prime with no big flow.	16.96095	144.87039	3279	292	2016-12-11T02_53_30.790114_S5K.jpg
2016-12-11	02:53:50	Looking west at the larger structure.	16.96098	144.87038	3278	273	2016-12-11T02_53_48.767991_S5K.jpg
2016-12-11	02:54:24	Some mussels here.	16.96103	144.87034	3281	188	2016-12-11T02_54_21.785526_S5K.jpg
2016-12-11	02:54:55	Mussels which haven't seen too many.	16.96103	144.87035	3281	196	2016-12-11T02_54_49.777202_S5K.jpg
2016-12-11	02:55:34	Now looking south at this chimney.	16.96103	144.87034	3281	194	2016-12-11T02_55_33.782363_S5K.jpg
2016-12-11	02:56:26	Going to lift away to waypoint #1 (Two Towers).	16.96103	144.87035	3281	192	1481424985940S5K12995.jpg
2016-12-11	02:57:59	Going west.	16.96101	144.87024	3280	262	2016-12-11T02_57_58.775632_S5K.jpg
2016-12-11	02:58:11	Highlights off, leaving WP 7.	16.96102	144.87019	3276	257	1481425091002S5K13100.jpg
2016-12-11	02:58:11	Moving the ship and the ROV to the west.	16.96102	144.87019	3276	257	2016-12-11T02_58_06.755724_S5K.jpg
2016-12-11	02:58:53	Waypoint 1 is 360m away.	16.96100	144.86989	3277	274	
2016-12-11	02:59:33	Lavas.	16.96099	144.86967	3279	263	1481425172961S5K13182.jpg
2016-12-11	02:59:48	Mostly lava with a little bit of hydrothermal deposits.	16.96098	144.86961	3280	250	2016-12-11T02_59_47.760302_S5K.jpg
2016-12-11	03:00:40	Waiting for the ship.	16.96097	144.86956	3280	254	1481425239805S5K13249.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	03:01:49	Fish.	16.96092	144.86933	3280	251	2016-12-11T03_01_48.780165_S5K.jpg
2016-12-11	03:04:47	Sheet flow.	16.96085	144.86895	3280	253	2016-12-11T03_04_42.793051_S5K.jpg
2016-12-11	03:08:06	Camera issues. Looks like lava with the occasional hydrothermal deposits.	16.96096	144.86871	3278	263	2016-12-11T03_07_58.786707_S5K.jpg
2016-12-11	03:09:06	Broken sheet flow.	16.96097	144.86858	3279	255	2016-12-11T03_09_04.783543_S5K.jpg
2016-12-11	03:09:37	Small crack.	16.96094	144.86844	3280	260	2016-12-11T03_09_35.781852_S5K.jpg
2016-12-11	03:11:11	Dusty lavas and little evidence of biology but flying high with camera focus issues.	16.96089	144.86822	3280	259	2016-12-11T03_11_07.769644_S5K.jpg
2016-12-11	03:12:25	Large broken lobate.	16.96089	144.86804	3282	254	2016-12-11T03_12_22.782128_S5K.jpg
2016-12-11	03:12:53	Pillow lavas with sediment.	16.96089	144.86795	3281	248	2016-12-11T03_12_47.770623_S5K.jpg
2016-12-11	03:13:35	Coming up high and to the north to avoid tethering Sequoia.	16.96097	144.86779	3272	294	
2016-12-11	03:18:54	Watching the chimneys in the sonar.	16.96141	144.86694	3268	239	
2016-12-11	03:19:44	Coming back down and see sheet flows with some squat lobsters. Two Towers should be 30m ahead due west.	16.96138	144.86690	3275	258	2016-12-11T03_19_42.777407_S5K.jpg
2016-12-11	03:21:03	Going to let tether and ROV to settle.	16.96135	144.86681	3275	277	2016-12-11T03_21_02.752640_S5K.jpg
2016-12-11	03:21:42	Old pile of broken up lava.	16.96135	144.86683	3280	275	1481426502035S5K14511.jpg
2016-12-11	03:22:01	Pressure ridge. Some squat lobsters.	16.96136	144.86678	3280	281	1481426520915S5K14530.jpg
2016-12-11	03:22:18	Transitioning into sulfides.	16.96137	144.86672	3280	272	1481426535887S5K14545.jpg
2016-12-11	03:23:05	Base of two towers?	16.96130	144.86664	3275	283	1481426582793S5K14592.jpg
2016-12-11	03:23:18	It is (the lights were going on and off).	16.96129	144.86661	3274	300	1481426597084S5K14606.jpg
2016-12-11	03:23:34	Going to do a video survey after the ship settles.	16.96131	144.86659	3274	283	2016-12-11T03_23_31.768494_S5K.jpg
2016-12-11	03:24:22	Looking at the east side of Two Towers.	16.96134	144.86658	3275	254	1481426662790S5K14672.jpg
2016-12-11	03:24:29	Highlights on, Two towers.	16.96133	144.86659	3274	260	1481426669111S5K14678.jpg
2016-12-11	03:25:05	Going up.	16.96132	144.86658	3273	279	2016-12-11T03_25_04.764152_S5K.jpg
2016-12-11	03:25:16	Hot water flanges with shrimp.	16.96132	144.86657	3272	279	1481426715902S5K14725.jpg
2016-12-11	03:25:33	Brown spires off the south side.	16.96132	144.86657	3272	284	2016-12-11T03_25_30.758690_S5K.jpg
2016-12-11	03:26:07	The two towers.	16.96132	144.86655	3269	285	2016-12-11T03_26_04.754866_S5K.jpg
2016-12-11	03:26:18	The top.	16.96133	144.86655	3267	283	2016-12-11T03_26_15.767216_S5K.jpg
2016-12-11	03:26:28	Coming back down the same side.	16.96133	144.86655	3268	277	2016-12-11T03_26_21.756117_S5K.jpg
2016-12-11	03:27:56	Attempted to sample here before.	16.96132	144.86657	3275	282	1481426870086S5K14879.jpg
2016-12-11	03:28:08	Pooling mirror of water under the flange.	16.96131	144.86657	3277	283	1481426880190S5K14889.jpg
2016-12-11	03:28:27	Coming around to video the west side of the chimney.	16.96134	144.86658	3276	279	1481426900933S5K14910.jpg
2016-12-11	03:28:59	Highlights off.	16.96138	144.86650	3275	189	2016-12-11T03_28_58.753614_S5K.jpg
2016-12-11	03:29:07	Turning counter-clockwise.	16.96138	144.86648	3276	165	1481426947009S5K14956.jpg
2016-12-11	03:29:21	Another big flange closer to the base.	16.96133	144.86646	3275	108	1481426958959S5K14968.jpg
2016-12-11	03:29:28	Highlights on, Two towers from another angle.	16.96132	144.86647	3275	101	2016-12-11T03_29_27.765814_S5K.jpg
2016-12-11	03:29:36	Going down to the bottom to get a full view.	16.96133	144.86647	3274	107	1481426976760S5K14985.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	03:30:20	Heading up Two Towers.	16.96133	144.86647	3277	116	1481427020285S5K15029.jpg
2016-12-11	03:30:50	Flange not as black as the other side.	16.96133	144.86648	3275	112	2016-12-11T03_30_49.774458_S5K.jpg
2016-12-11	03:31:41	Wispy black smoke.	16.96131	144.86648	3270	93	2016-12-11T03_31_40.745341_S5K.jpg
2016-12-11	03:32:09	Coming down again on the west side.	16.96132	144.86648	3268	98	2016-12-11T03_32_02.765030_S5K.jpg
2016-12-11	03:32:28	Highlights off and then on again.	16.96128	144.86648	3270	83	2016-12-11T03_32_27.783501_S5K.jpg
2016-12-11	03:33:54	Concentrated shrimp or snails.	16.96127	144.86652	3276	75	2016-12-11T03_33_51.785077_S5K.jpg
2016-12-11	03:34:34	Going back to the top and take a look at the black smoker.	16.96130	144.86649	3275	82	2016-12-11T03_34_33.755343_S5K.jpg
2016-12-11	03:34:52	First going to look under the flange here.	16.96133	144.86649	3276	124	2016-12-11T03_34_51.787410_S5K.jpg
2016-12-11	03:35:46	Highlights off.	16.96135	144.86649	3277	124	1481427346003S5K15355.jpg
2016-12-11	03:35:52	Going back around to the east side and the black smoker.	16.96136	144.86649	3275	135	2016-12-11T03_35_51.766756_S5K.jpg
2016-12-11	03:36:24	Coming around the top.	16.96137	144.86655	3269	215	2016-12-11T03_36_23.763328_S5K.jpg
2016-12-11	03:36:35	East tower much more active than the west one.	16.96134	144.86655	3268	246	2016-12-11T03_36_34.775167_S5K.jpg
2016-12-11	03:37:02	Highlights on, top to Two Towers.	16.96130	144.86655	3268	299	2016-12-11T03_37_01.777535_S5K.jpg
2016-12-11	03:38:33	Highlights off.	16.96129	144.86652	3268	311	2016-12-11T03_38_32.763426_S5K.jpg
2016-12-11	03:38:58	Going to put the porch out to wedge in.	16.96129	144.86653	3268	308	2016-12-11T03_38_57.791988_S5K.jpg
2016-12-11	03:40:58	Approaching the smoker gently to sample the black smoker.	16.96129	144.86651	3268	316	2016-12-11T03_40_49.767328_S5K.jpg
2016-12-11	03:42:22	HD new file started.	16.96129	144.86653	3268	338	2016-12-11T03_42_21.746136_S5K.jpg
2016-12-11	03:46:20	Preparing the Beast for sampling.	16.96133	144.86660	3269	350	1481427979889S5K15989.jpg
2016-12-11	03:48:26	Ambient is already above 7deg.	16.96130	144.86655	3269	348	1481428106007S5K16115.jpg
2016-12-11	03:49:49	62deg here.	16.96129	144.86655	3269	350	2016-12-11T03_49_48.758758_S5K.jpg
2016-12-11	03:50:26	30deg in the smoke.	16.96128	144.86656	3269	349	2016-12-11T03_50_26.765518_S5K.jpg
2016-12-11	03:50:50	Great location.	16.96127	144.86656	3269	349	2016-12-11T03_50_48.755374_S5K.jpg
2016-12-11	03:51:44	Got up to 187....	16.96126	144.86654	3269	348	2016-12-11T03_51_42.779482_S5K.jpg
2016-12-11	03:52:09	Broke some of the top off. 180deg....	16.96126	144.86653	3269	349	2016-12-11T03_52_08.768267_S5K.jpg
2016-12-11	03:52:54	Vehicle moved.	16.96128	144.86652	3269	350	2016-12-11T03_52_53.782217_S5K.jpg
2016-12-11	03:53:24	240....	16.96128	144.86652	3269	349	2016-12-11T03_53_23.776718_S5K.jpg
2016-12-11	03:53:55	281...	16.96128	144.86653	3269	349	2016-12-11T03_53_54.777717_S5K.jpg
2016-12-11	03:54:23	Good!	16.96127	144.86653	3269	349	
2016-12-11	03:54:38	S44-HFS-03 Filtered Piston #1. Right in the black smoke at the top of Two Towers. Great location. Can see exhaust.	16.96127	144.86654	3269	349	1481428477805S5K16487.jpg
2016-12-11	03:55:34	Good flow from the piston water.	16.96127	144.86652	3269	349	2016-12-11T03_55_33.774068_S5K.jpg
2016-12-11	03:56:09	Stop. Tmax=331.8 Tavg=327.5 vol=260 T2=66	16.96128	144.86651	3269	343	2016-12-11T03_56_08.773806_S5K.jpg
2016-12-11	03:56:48	Wand slipped out and stopped the sample.	16.96129	144.86649	3269	345	
2016-12-11	03:57:23	Not sure if that was filtered or not...check later.	16.96131	144.86648	3269	347	
2016-12-11	03:58:01	Background from the MAPR is 2deg up from 1-something at the bottom.	16.96135	144.86646	3269	349	

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	03:59:49	Seeing ORP display on the MAPR.	16.96129	144.86652	3269	347	
2016-12-11	04:01:04	Trying again. Deflecting and reading over 234....	16.96130	144.86652	3269	347	1481428864091S5K16873.jpg
2016-12-11	04:01:37	Highlights on. Sampling on top of Two Towers.	16.96130	144.86652	3269	347	2016-12-11T04_01_36.769852_S5K.jpg
2016-12-11	04:02:15	High was 240...move down a bit.	16.96131	144.86652	3269	347	2016-12-11T04_02_14.770971_S5K.jpg
2016-12-11	04:02:43	Good placement.	16.96131	144.86652	3269	347	2016-12-11T04_02_42.767545_S5K.jpg
2016-12-11	04:03:29	Pump off the temp went down and now on coming back up.	16.96131	144.86652	3269	347	2016-12-11T04_03_28.778919_S5K.jpg
2016-12-11	04:05:17	S44-HFS-04 Unfiltered Piston #3 At the top of Two Towers same chimlet at the first sample.	16.96131	144.86653	3269	347	2016-12-11T04_05_16.786259_S5K.jpg
2016-12-11	04:05:38	Highlights off at some point.	16.96130	144.86653	3269	347	1481429137926S5K17147.jpg
2016-12-11	04:06:27	Pulled out and stopped pump.	16.96130	144.86655	3269	343	
2016-12-11	04:06:43	Sample running without the flush pump.	16.96129	144.86655	3269	346	
2016-12-11	04:07:11	Slight reposition of the wand.	16.96129	144.86656	3269	345	1481429230859S5K17240.jpg
2016-12-11	04:07:26	Paused at vol=350ml.	16.96130	144.86655	3269	346	2016-12-11T04_07_25.785814_S5K.jpg
2016-12-11	04:07:45	Pump on.	16.96130	144.86655	3269	346	2016-12-11T04_07_44.767857_S5K.jpg
2016-12-11	04:08:12	Highlights on for a minute. 04:07- 04:08	16.96129	144.86654	3269	343	2016-12-11T04_08_11.758862_S5K.jpg
2016-12-11	04:08:19	Good sample!	16.96129	144.86654	3269	343	2016-12-11T04_08_18.767235_S5K.jpg
2016-12-11	04:08:29	Sample pump on....326....	16.96129	144.86654	3269	343	2016-12-11T04_08_28.777543_S5K.jpg
2016-12-11	04:09:19	Stop Tmax=342.3 Tavg=333.5 vol=520 T2=65	16.96129	144.86654	3269	343	
2016-12-11	04:09:48	Going to take another...temp up to 344.5..344.6...	16.96129	144.86654	3269	343	
2016-12-11	04:10:10	S44-HFS-05 Temp is stable at 345ish. Still at the same chimlet with great placement.	16.96130	144.86653	3269	343	
2016-12-11	04:11:15	Temp is slightly climbing.	16.96129	144.86655	3269	342	2016-12-11T04_11_14.778411_S5K.jpg
2016-12-11	04:12:00	Highlights on.	16.96129	144.86655	3269	341	2016-12-11T04_11_59.821326_S5K.jpg
2016-12-11	04:12:58	Crab eating off the others leg (not eating the leg).	16.96130	144.86657	3269	345	2016-12-11T04_12_58.787741_S5K.jpg
2016-12-11	04:14:01	Stop. Tmax=348. Tavg=346.7 vol=601 T2=74.	16.96132	144.86659	3269	346	2016-12-11T04_13_59.781940_S5K.jpg
2016-12-11	04:14:31	Highlights off.	16.96133	144.86661	3269	345	2016-12-11T04_14_30.771857_S5K.jpg
2016-12-11	04:14:53	Going to try for a gas sample here.	16.96133	144.86661	3269	347	1481429693188S5K17702.jpg
2016-12-11	04:16:39	Stowing the HFS wand.	16.96137	144.86665	3269	345	1481429798095S5K17807.jpg
2016-12-11	04:17:11	There is the gas-tight bottle.	16.96135	144.86663	3269	342	2016-12-11T04_17_10.769637_S5K.jpg
2016-12-11	04:17:57	Reaching for the bungee.	16.96130	144.86654	3269	342	2016-12-11T04_17_56.781955_S5K.jpg
2016-12-11	04:18:56	Got the bungee off.	16.96130	144.86655	3269	341	1481429935943S5K17945.jpg
2016-12-11	04:19:31	Now will get the GTB out of the basket.	16.96130	144.86655	3269	340	
2016-12-11	04:20:15	Got a grip.	16.96130	144.86655	3269	340	2016-12-11T04_20_14.781694_S5K.jpg
2016-12-11	04:20:57	Ram fits.	16.96130	144.86654	3268	340	1481430055207S5K18064.jpg
2016-12-11	04:21:56	Ram slightly not aligned so won't accidently bump it.	16.96130	144.86654	3269	340	2016-12-11T04_21_55.791635_S5K.jpg
2016-12-11	04:23:40	S44-GTB-06 Fired and saw it suck up in perfect position. In the same chimlet as the HFS samples. Good deflection of the flow.	16.96132	144.86659	3269	335	2016-12-11T04_23_39.797330_S5K.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	04:25:33	Going to stow the gastight bottle and thinking of trying to sample a chimney.	16.96132	144.86657	3269	338	2016-12-11T04_25_32.766803_S5K.jpg
2016-12-11	04:30:12	Gastight is secure in milk crate.	16.96131	144.86655	3269	336	1481430610994S5K18620.jpg
2016-12-11	04:31:07	Attempting to take a chimney.	16.96130	144.86653	3269	337	2016-12-11T04_31_06.825542_S5K.jpg
2016-12-11	04:31:46	ROV broke away from its position.	16.96130	144.86652	3269	344	2016-12-11T04_31_43.787855_S5K.jpg
2016-12-11	04:32:05	Coming back up to the top. Been at the top looking north while taking these samples.	16.96130	144.86651	3269	357	2016-12-11T04_32_04.808611_S5K.jpg
2016-12-11	04:33:39	Trying to grab the chimney just sampled.	16.96132	144.86650	3269	1	1481430817038S5K18826.jpg
2016-12-11	04:36:02	Very solid and won't come off.	16.96119	144.86643	3269	339	2016-12-11T04_36_01.839319_S5K.jpg
2016-12-11	04:37:01	S44-Geo-07 From the chimlet that the water & gas samples were taken. Tiny piece in the jaw. Put in the STBD-aft biobox. Some pieces on the sled.	16.96119	144.86643	3269	322	2016-12-11T04_37_00.807459_S5K.jpg
2016-12-11	04:38:37	Can see a few pieces on the basket.	16.96110	144.86642	3275	328	
2016-12-11	04:39:22	Coming to the bottom to see if that piece can be retrieved off the sled.	16.96106	144.86641	3281	350	
2016-12-11	04:39:51	On the bottom of Two Towers.	16.96102	144.86648	3286	360	2016-12-11T04_39_49.813925_S5K.jpg
2016-12-11	04:40:30	There is the piece.	16.96102	144.86648	3286	359	
2016-12-11	04:40:46	Grabbing the piece.	16.96103	144.86648	3286	357	
2016-12-11	04:41:04	Putting it in the biobox.	16.96103	144.86648	3286	352	1481431263168S5K19272.jpg
2016-12-11	04:42:02	One more piece on the basket.	16.96104	144.86650	3286	345	
2016-12-11	04:42:35	Came off the bottom unintentionally.	16.96105	144.86651	3286	348	
2016-12-11	04:43:01	O2 is coming up on the beast and not sure why.	16.96105	144.86652	3286	348	
2016-12-11	04:43:14	Flushing the Beast out.	16.96106	144.86653	3286	348	
2016-12-11	04:43:50	Running low on time and need to go to Waypoint #6 Voodoo.	16.96106	144.86654	3286	350	
2016-12-11	04:45:00	Last view of the base of Two Towers.	16.96113	144.86653	3280	327	2016-12-11T04_44_58.829708_S5K.jpg
2016-12-11	04:46:26	Turning around counter-clockwise to the east to head for Voodoo.	16.96130	144.86645	3270	230	
2016-12-11	04:47:38	Will need to avoid Sequoia on the transit to the east.	16.96124	144.86636	3270	166	
2016-12-11	04:48:15	Basket check.	16.96111	144.86640	3267	150	2016-12-11T04_48_14.830246_S5K.jpg
2016-12-11	04:49:25	Heading NE to avoid Sequoia.	16.96116	144.86670	3269	68	
2016-12-11	04:51:23	Transiting above the bottom to make haste to Voodoo.	16.96141	144.86721	3267	102	
2016-12-11	04:56:39	Want to come in low to the cone and get a rock just on the outside of the cone quickly.	16.96173	144.86848	3264	82	
2016-12-11	05:00:07	Nice arc-trace of the cone in the sonar.	16.96177	144.86855	3277	81	
2016-12-11	05:00:27	Back near the bottom and the cone.	16.96176	144.86853	3279	83	2016-12-11T05_00_27.817455_S5K.jpg
2016-12-11	05:01:12	Seeing just a couple of squat lobsters and rough rocks below.	16.96178	144.86861	3279	84	2016-12-11T05_01_11.831323_S5K.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	05:01:43	Looks like lava here.	16.96178	144.86866	3280	84	1481432501077S5K20510.jpg
2016-12-11	05:02:30	Approaching the cone.	16.96180	144.86873	3280	82	2016-12-11T05_02_30.839283_S5K.jpg
2016-12-11	05:02:54	Some alteration here but looks like lava and maybe the beginning of the cone in the background.	16.96181	144.86875	3282	108	1481432574046S5K20583.jpg
2016-12-11	05:03:28	Coming up on the edge of the cone.	16.96181	144.86877	3282	110	2016-12-11T05_03_27.833180_S5K.jpg
2016-12-11	05:04:43	Grabbing a rock to determine if its sulfide or lava ejected from the cone.	16.96181	144.86879	3282	120	2016-12-11T05_04_42.847446_S5K.jpg
2016-12-11	05:05:06	Could be on the edge of the transition zone here.	16.96181	144.86879	3282	121	2016-12-11T05_05_05.838718_S5K.jpg
2016-12-11	05:05:31	Anything in the view would be good.	16.96181	144.86879	3282	121	2016-12-11T05_05_30.824150_S5K.jpg
2016-12-11	05:06:51	Green material?	16.96179	144.86877	3284	120	1481432810963S5K20820.jpg
2016-12-11	05:07:44	Soft material.	16.96176	144.86875	3284	120	2016-12-11T05_07_42.852611_S5K.jpg
2016-12-11	05:08:35	Very crumbly.	16.96172	144.86873	3284	118	2016-12-11T05_08_34.865480_S5K.jpg
2016-12-11	05:11:46	S44-Geo-08 Sample of sulfide just outside the cone on the west wall. Material is definitely not basalt as it crumbles easily.	16.96146	144.86867	3284	118	2016-12-11T05_11_45.849272_S5K.jpg
2016-12-11	05:14:22	In the port-front biobox in the stbd-forward quarter.	16.96116	144.86864	3284	117	2016-12-11T05_14_21.869738_S5K.jpg
2016-12-11	05:14:57	View of the sampling site with the other rocks crumbled with a gray-interior.	16.96108	144.86863	3283	120	2016-12-11T05_14_56.836005_S5K.jpg
2016-12-11	05:15:29	Climbing up the west wall of the cone.	16.96102	144.86862	3280	120	2016-12-11T05_15_28.854387_S5K.jpg
2016-12-11	05:15:50	Steep outside wall.	16.96094	144.86866	3280	119	2016-12-11T05_15_49.849820_S5K.jpg
2016-12-11	05:16:08	Cresting the top of the cone.	16.96090	144.86865	3277	120	1481433368090S5K21377.jpg
2016-12-11	05:16:19	Crest has more hydrothermal activity and animals.	16.96086	144.86866	3276	119	1481433378842S5K21388.jpg
2016-12-11	05:17:14	Milky cloud over the cone.	16.96070	144.86871	3276	113	1481433433973S5K21443.jpg
2016-12-11	05:17:35	Beast sensors are not making sense especially the O2. Might not have been flushed before going down.	16.96063	144.86873	3277	100	
2016-12-11	05:18:06	Or could be a compressed air bubble.	16.96055	144.86868	3275	55	
2016-12-11	05:18:31	Driving along the crest of the cone since we have lost navigation.	16.96047	144.86869	3275	56	2016-12-11T05_18_29.838141_S5K.jpg
2016-12-11	05:19:29	There is the Marker for the site. Mkr-171.	16.96168	144.86923	3274	104	2016-12-11T05_19_28.836344_S5K.jpg
2016-12-11	05:20:42	There is the hoop, MAPR and other instruments.	16.96190	144.86919	3275	133	1481433642087S5K21651.jpg
2016-12-11	05:21:02	Positioning the vehicle for finishing the work here.	16.96184	144.86922	3274	193	1481433662061S5K21671.jpg
2016-12-11	05:21:12	highlights on	16.96184	144.86923	3274	202	
2016-12-11	05:21:24	Pilot cam is directly over the MAPR.	16.96182	144.86923	3274	200	2016-12-11T05_21_23.855649_S5K.jpg
2016-12-11	05:21:38	First is a vehicle assessment of the site and the position of the array.	16.96181	144.86923	3275	200	2016-12-11T05_21_37.870785_S5K.jpg
2016-12-11	05:23:32	View of the array.	16.96174	144.86920	3276	105	2016-12-11T05_23_31.859805_S5K.jpg
2016-12-11	05:23:45	Getting overview of Hula Temperature Array with the Science Camera.	16.96174	144.86920	3277	105	1481433824893S5K21834.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	05:24:55	Taking camera views of the array with the science and pilot cameras.	16.96173	144.86919	3277	103	2016-12-11T05_24_54.883345_S5K.jpg
2016-12-11	05:27:49	highlights off	16.96175	144.86916	3276	91	
2016-12-11	05:28:16	Going to grab the MAPR first.	16.96176	144.86917	3276	89	2016-12-11T05_28_15.866395_S5K.jpg
2016-12-11	05:29:23	Getting the vehicle stable.	16.96177	144.86919	3278	91	1481434162898S5K22172.jpg
2016-12-11	05:29:54	Getting the MAPR.	16.96177	144.86919	3278	90	
2016-12-11	05:30:15	RECOVER the MAPR. Shaking the device to remove the snails. Putting in the biobox.	16.96176	144.86920	3278	90	2016-12-11T05_30_14.860200_S5K.jpg
2016-12-11	05:31:14	Placing the MAPR in the biobox.	16.96176	144.86918	3278	89	1481434274215S5K22283.jpg
2016-12-11	05:31:41	A few snails are refusing to leave.	16.96176	144.86918	3278	88	2016-12-11T05_31_39.879472_S5K.jpg
2016-12-11	05:32:11	There are chimney sample pieces from Two Towers already in the biobox.	16.96176	144.86917	3278	88	1481434331070S5K22340.jpg
2016-12-11	05:32:49	MAPR should have been in water no higher than 30°C.	16.96176	144.86916	3278	88	1481434368937S5K22378.jpg
2016-12-11	05:33:20	Next will try some fluid sampling in the array.	16.96175	144.86915	3278	89	2016-12-11T05_33_18.881019_S5K.jpg
2016-12-11	05:34:31	Have the HFS wand and ready to sample.	16.96172	144.86913	3278	89	2016-12-11T05_34_30.886343_S5K.jpg
2016-12-11	05:37:14	Robosnail moved near #2.	16.96175	144.86918	3278	86	2016-12-11T05_37_05.867670_S5K.jpg
2016-12-11	05:37:59	View of hoop is 90deg from that during deployment.	16.96176	144.86920	3278	85	2016-12-11T05_37_58.856080_S5K.jpg
2016-12-11	05:38:15	The wand may be near recorder #6 and 7.	16.96176	144.86921	3278	85	1481434694170S5K22703.jpg
2016-12-11	05:39:24	Location here for a sensor reading. Going to also take a lot of water samples at this exact location.	16.96176	144.86922	3278	85	2016-12-11T05_39_23.874548_S5K.jpg
2016-12-11	05:40:23	Temp=30.6 pH=5.6 O2=1.26 at Location #1.	16.96175	144.86923	3278	85	
2016-12-11	05:41:09	Turning sensors off to switch to water sampling.	16.96175	144.86924	3278	85	
2016-12-11	05:41:28	Highlights on	16.96175	144.86924	3278	85	
2016-12-11	05:41:58	S44-HFS-09 Start 05:41. Unfiltered Piston #5 at recorder #6 inside the array at Voodoo. Not seeing good flow on this one in the exhaust.	16.96175	144.86924	3278	85	1481434917399S5K22926.jpg
2016-12-11	05:44:20	Stop. Tmax=32.3 Tavg=30.0 vol=486 T2=12.	16.96174	144.86925	3278	85	
2016-12-11	05:45:23	S44-HFS-10 Start 05:45. Unfiltered Piston #6 Same exact location. Not seeing exhaust again.	16.96174	144.86924	3278	85	2016-12-11T05_45_21.870903_S5K.jpg
2016-12-11	05:47:55	Gave Beast a backwards flow pump.	16.96176	144.86921	3278	85	
2016-12-11	05:48:15	Started pump again.	16.96175	144.86920	3278	85	
2016-12-11	05:48:46	Not seeing exhaust.	16.96176	144.86920	3278	85	
2016-12-11	05:48:58	Flush pump back on.	16.96176	144.86919	3278	85	2016-12-11T05_48_57.894836_S5K.jpg
2016-12-11	05:50:25	Stop. Tmax=32.5 Tavg=23.5 vol=700 T2=10.	16.96176	144.86919	3278	85	
2016-12-11	05:51:07	Will try a long LVB next.	16.96176	144.86919	3278	85	
2016-12-11	05:51:52	Changed mind and will try a bag next.	16.96175	144.86919	3278	85	
2016-12-11	05:52:35	S44-HFS-11 Start 05:52. Filtered Bag #19. Getting good exhaust.	16.96176	144.86920	3278	85	2016-12-11T05_52_34.878645_S5K.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	05:53:34	Highlights off	16.96176	144.86920	3278	85	
2016-12-11	05:53:44	Exact same location.	16.96176	144.86920	3278	85	2016-12-11T05_53_43.879660_S5K.jpg
2016-12-11	05:55:41	Stop. Tmax=31.2 Tavg=27 vol=450 T2=11	16.96176	144.86919	3278	85	
2016-12-11	05:57:49	S44-HFS-12 LVB #24 Near recorder 6 in the Hula array at the same location as the last samples.	16.96176	144.86919	3278	85	1481435869056S5K23878.jpg
2016-12-11	06:20:19	Stop. Tmax=35 Tavg=29.7 vol=3402 T2=12.	16.96174	144.86919	3278	86	2016-12-11T06_20_18.910341_S5K.jpg
2016-12-11	06:22:21	S44-HFS-13 DNA Filter #10 Same location as LVB and previous water samples in the Hula array.	16.96176	144.86921	3278	86	2016-12-11T06_22_20.903567_S5K.jpg
2016-12-11	06:34:06	This image looks like it may have been clear.	16.96184	144.86919	3278	86	2016-12-11T06_34_05.907892_S5K.jpg
2016-12-11	06:36:11	That image was not clear.	16.96181	144.86919	3278	86	
2016-12-11	06:38:55	Something bumped on the vehicle but the wand stayed in place.	16.96177	144.86921	3278	86	
2016-12-11	06:47:26	Stop. Tmax=37.4 Tavg=30.9 vol=3002 T2=11.	16.96172	144.86920	3278	86	
2016-12-11	06:49:00	Start 06:49 Filtered Bag #16 At the same exact location in the Hula array.	16.96174	144.86920	3278	86	2016-12-11T06_48_59.936849_S5K.jpg
2016-12-11	06:50:27	Good exhaust on this sample.	16.96176	144.86922	3278	86	
2016-12-11	06:50:54	Picture with moment of clarity.	16.96176	144.86922	3278	86	2016-12-11T06_50_51.948705_S5K.jpg
2016-12-11	06:51:55	Tmax=37.7 Tavg=34.9 vol=451 T2=12.5	16.96178	144.86924	3278	86	
2016-12-11	06:52:47	Going to take a sensor reading.	16.96180	144.86925	3278	86	
2016-12-11	06:53:09	So far Beast has pumped 8 liters of water today.	16.96180	144.86925	3278	86	
2016-12-11	06:53:34	Started the pump.	16.96180	144.86925	3278	86	
2016-12-11	06:55:02	Temp=32.5 pH=5.57 O2=.8 at the same location as the water samples.	16.96181	144.86922	3278	86	
2016-12-11	06:55:44	Going to move the wand for another sensor reading.	16.96181	144.86921	3278	86	
2016-12-11	06:56:50	Sensors at this location in the array. Temp=6.7 pH=6.41 O2=2.08 Second reading this time.	16.96179	144.86921	3278	86	1481439410214S5K27419.jpg
2016-12-11	06:57:51	Looking for contrasting temperature sites to sample for animals.	16.96178	144.86921	3278	86	1481439470975S5K27480.jpg
2016-12-11	06:58:24	Done with sensor readings. Need to sample the hot water site in the array.	16.96177	144.86921	3278	86	2016-12-11T06_58_22.932613_S5K.jpg
2016-12-11	06:59:27	Things jiggled a tiny bit when the wand was pulled out.	16.96175	144.86922	3278	83	1481439566018S5K27575.jpg
2016-12-11	07:00:23	Can't get the wand down without moving the array.	16.96174	144.86923	3278	83	1481439623289S5K27632.jpg
2016-12-11	07:01:00	Going to try from inside the array.	16.96175	144.86923	3278	83	2016-12-11T07_00_59.918746_S5K.jpg
2016-12-11	07:11:27	Stowing the HFS wand.	16.96175	144.86915	3278	81	2016-12-11T07_11_23.946114_S5K.jpg
2016-12-11	07:12:47	Grabbing the robosnails.	16.96172	144.86917	3278	81	
2016-12-11	07:13:06	RECOVER Robo Mussel with Red Tape on the monkey fist. Putting into the biobox.	16.96172	144.86918	3278	81	2016-12-11T07_13_05.944867_S5K.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	07:14:24	Placing Red Robo Mussel into the forward portion to the port of the biobox.	16.96172	144.86919	3278	81	2016-12-11T07_14_22.958442_S5K.jpg
2016-12-11	07:15:17	Tape is sticking to the monkey fist.	16.96173	144.86919	3278	81	2016-12-11T07_15_16.946861_S5K.jpg
2016-12-11	07:15:50	It finally released.	16.96174	144.86920	3278	81	1481440548994S5K28558.jpg
2016-12-11	07:16:24	Recovering the yellow monkey fist Robo mussel next.	16.96175	144.86920	3278	81	2016-12-11T07_16_23.938309_S5K.jpg
2016-12-11	07:17:09	Recovery is pulling on the net.	16.96177	144.86921	3278	81	2016-12-11T07_17_08.954747_S5K.jpg
2016-12-11	07:18:05	Going to try with the other arm.	16.96179	144.86922	3278	81	1481440684996S5K28694.jpg
2016-12-11	07:18:35	Going to leave that robo mussel as in the arm camera it is stuck under the net.	16.96179	144.86923	3278	81	2016-12-11T07_18_34.941118_S5K.jpg
2016-12-11	07:19:06	RECOVER Robo Snail (black-white) and putting in the biobox.	16.96180	144.86923	3278	80	2016-12-11T07_19_05.945384_S5K.jpg
2016-12-11	07:19:36	In the biobox.	16.96180	144.86923	3278	80	2016-12-11T07_19_27.960951_S5K.jpg
2016-12-11	07:20:07	Arm camera is showing black tape Robo mussel was just on the inside rim of the hula-hoop.	16.96181	144.86923	3278	80	1481440807282S5K28816.jpg
2016-12-11	07:20:35	Got it.	16.96181	144.86923	3278	80	2016-12-11T07_20_34.962898_S5K.jpg
2016-12-11	07:20:51	RECOVER Black Robo Mussel.	16.96180	144.86922	3278	80	2016-12-11T07_20_52.948112_S5K.jpg
2016-12-11	07:20:55	snails on robomussel.	16.96180	144.86922	3278	80	2016-12-11T07_20_54.951232_S5K.jpg
2016-12-11	07:22:57	Picking up the Beast wand that was hanging over the side of the basket.	16.96178	144.86920	3278	80	2016-12-11T07_22_56.938895_S5K.jpg
2016-12-11	07:23:15	Putting it on the porch temporarily.	16.96178	144.86920	3278	80	1481440995039S5K29004.jpg
2016-12-11	07:24:16	Picking up the hoop in one arm and suction in the other.	16.96178	144.86920	3278	80	2016-12-11T07_24_15.954697_S5K.jpg
2016-12-11	07:25:59	Pushing the suction nozzle down.	16.96177	144.86919	3278	80	2016-12-11T07_25_57.957577_S5K.jpg
2016-12-11	07:26:59	Picked up the hoop.	16.96178	144.86919	3278	80	2016-12-11T07_26_58.952090_S5K.jpg
2016-12-11	07:27:28	Holding the hoop off to the side.	16.96177	144.86918	3278	80	2016-12-11T07_27_27.946504_S5K.jpg
2016-12-11	07:27:46	Mussel hanging on.	16.96177	144.86918	3278	80	1481441265364S5K29274.jpg
2016-12-11	07:28:44	Next is suctioning. Index to jar #7.	16.96177	144.86918	3278	80	
2016-12-11	07:29:52	First suction site from under the hoop will be the low-T site where the fluid samples were taken. Want about 20 snails.	16.96176	144.86919	3278	81	1481441392454S5K29401.jpg
2016-12-11	07:30:43	S44-Bio-15 in the Hula array at the low-T HFS sample site within the array. Hula array just lifted away. Going into jar #7.	16.96175	144.86919	3278	85	2016-12-11T07_30_42.949903_S5K.jpg
2016-12-11	07:32:00	Seeing snails come into jar.	16.96176	144.86920	3278	84	2016-12-11T07_31_58.941603_S5K.jpg
2016-12-11	07:32:22	Suction off to get crab out and try again.	16.96177	144.86920	3278	83	2016-12-11T07_32_21.963414_S5K.jpg
2016-12-11	07:32:44	Full suction on again.	16.96177	144.86920	3278	83	2016-12-11T07_32_43.953450_S5K.jpg
2016-12-11	07:33:03	Another one came in and seeing flow.	16.96177	144.86919	3278	83	2016-12-11T07_33_01.938627_S5K.jpg
2016-12-11	07:34:04	Enough at that site.	16.96177	144.86919	3278	82	
2016-12-11	07:34:22	Shaking hose to get last snails.	16.96177	144.86919	3278	82	

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	07:34:46	Index to jar #6.	16.96176	144.86919	3278	82	
2016-12-11	07:35:10	Crab came into the jar before suctioning here from the other suction location.	16.96176	144.86920	3278	82	
2016-12-11	07:35:58	S44-Bio-16 Start suction of snails. This is the 30°C HFS sample site within the array. Put into jar #6.	16.96174	144.86921	3278	83	1481441758045S5K29767.jpg
2016-12-11	07:36:51	Continuing to suction.	16.96172	144.86922	3278	83	1481441811222S5K29820.jpg
2016-12-11	07:37:06	Done.	16.96172	144.86923	3278	83	
2016-12-11	07:38:43	Next is the high temperature water sample.	16.96172	144.86924	3278	82	
2016-12-11	07:41:06	Going to the intense flow area that was within the array with the Beast.	16.96178	144.86925	3278	81	2016-12-11T07_41_05.962420_S5K.jpg
2016-12-11	07:43:01	Lifting the hoop a bit to get the robo mussel out of the view.	16.96182	144.86924	3278	81	2016-12-11T07_43_00.973993_S5K.jpg
2016-12-11	07:45:28	Can see the wand tip on a non-recording camera in the big flow. Temp at 49.....	16.96178	144.86922	3278	81	2016-12-11T07_45_27.957535_S5K.jpg
2016-12-11	07:46:58	Just up to 70deg there.	16.96176	144.86921	3278	81	2016-12-11T07_46_57.977819_S5K.jpg
2016-12-11	07:48:17	Start 07:48. Unfiltered Piston #8. In the maximum heat area under the hula array after the array was lifted.	16.96176	144.86919	3278	81	1481442496969S5K30506.jpg
2016-12-11	07:49:51	Stopping the pump. Got bumped out of place. Repositioning.	16.96176	144.86919	3278	80	2016-12-11T07_49_49.951344_S5K.jpg
2016-12-11	07:51:29	Repositioning to get a better view.	16.96178	144.86917	3278	80	2016-12-11T07_51_28.951457_S5K.jpg
2016-12-11	07:53:01	Starting pump again. Temp is higher than before.	16.96178	144.86916	3278	79	2016-12-11T07_52_59.971819_S5K.jpg
2016-12-11	07:53:58	Flow looks good in the exhaust.	16.96177	144.86917	3278	79	
2016-12-11	07:55:12	Stop. Tmax=91.7 Tavg=86.6 vol=596	16.96176	144.86919	3278	79	
2016-12-11	07:55:45	Start 07:55 Unfiltered Piston #7. Same place in the high-T flow.	16.96175	144.86920	3278	79	2016-12-11T07_55_44.962406_S5K.jpg
2016-12-11	07:59:10	Stop. Tmax=107 Tavg=87 vol=537	16.96173	144.86921	3278	79	
2016-12-11	08:00:10	S44-HFS-19 Start 08:00 .Filtered bag #17. Good exhaust.	16.96174	144.86920	3278	79	1481443209256S5K31218.jpg
2016-12-11	08:02:47	Stop. Tmax=95.1 Tavg=54.8 vol=400 T2=20	16.96177	144.86921	3278	80	2016-12-11T08_02_46.954639_S5K.jpg
2016-12-11	08:03:28	Stowing the Beast's wand.	16.96176	144.86921	3278	79	2016-12-11T08_03_27.961998_S5K.jpg
2016-12-11	08:07:33	Got the bungee on.	16.96173	144.86924	3278	79	2016-12-11T08_07_32.973004_S5K.jpg
2016-12-11	08:07:54	Reaching for Robo-mussel.	16.96173	144.86923	3278	79	2016-12-11T08_07_53.959373_S5K.jpg
2016-12-11	08:08:45	Got it!	16.96173	144.86922	3279	79	1481443725302S5K31734.jpg
2016-12-11	08:10:16	Now preparing to store the hula-hoop.	16.96174	144.86920	3279	79	2016-12-11T08_10_15.957514_S5K.jpg
2016-12-11	08:11:33	Shaking snails off the hula hoop.	16.96176	144.86918	3279	79	2016-12-11T08_11_32.977407_S5K.jpg
2016-12-11	08:13:40	Getting bungee ready.	16.96179	144.86914	3276	76	1481444019195S5K32028.jpg
2016-12-11	08:15:23	Bringing hula to porch.	16.96186	144.86917	3276	78	2016-12-11T08_15_22.965476_S5K.jpg
2016-12-11	08:16:35	Slowly leaving the bottom.	16.96187	144.86916	3275	78	1481444195064S5K32204.jpg

Date	Time	S44 - Hafa Adai - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-11	08:17:14	Safety hook is on the hula.	16.96175	144.86907	3272	248	1481444233412S5K32242.jpg

Table 6.6-11 Dive S45 – New Lava Flow

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	01:22	Can see the bottom.	15.43013	144.50363	4036	286	2016-12-12T01_22_30.520489_S5K.jpg
2016-12-12	01:23	New lava-no surprise!	15.43013	144.50363	4041	286	S5K09249.jpg
2016-12-12	01:24	At waypoint #1 for dive S-45 in the new flow.	15.43013	144.50363	4041	287	2016-12-12T01_24_30.512144_S5K.jpg
2016-12-12	01:26	Moving forward a bit looking for a piece of lava to collect.	15.43013	144.50360	4041	293	2016-12-12T01_26_49.518889_S5K.jpg
2016-12-12	01:26	HD recording stopped while figuring something out. H264 still recording.	15.43014	144.50360	4041	292	2016-12-12T01_26_56.525063_S5K.jpg
2016-12-12	01:28	Yellow staining where the warm fluids had been coming out but no shimmer at this point.	15.43016	144.50354	4043	301	S5K09497.jpg
2016-12-12	01:28	Striations in some of the pillows.	15.43018	144.50353	4042	315	S5K09546.jpg
2016-12-12	01:29	HD recording back on.	15.43020	144.50351	4040	309	S5K09591.jpg
2016-12-12	01:31	Going to get a piece of lava.	15.43019	144.50349	4045	299	2016-12-12T01_31_24.533212_S5K.jpg
2016-12-12	01:33	Pieces are just out of reach.	15.43022	144.50348	4046	292	2016-12-12T01_33_46.548537_S5K.jpg
2016-12-12	01:34	Trying with both arms.	15.43023	144.50350	4046	292	S5K09860.jpg
2016-12-12	01:36	S45-Geo-01 Piece of new lava about 10m west of waypoint #1 in the new lava flow.	15.43023	144.50347	4045	292	1481506591039S5K10002.jpg
2016-12-12	01:36	Got one.	15.43023	144.50347	4045	292	2016-12-12T01_36_38.546247_S5K.jpg
2016-12-12	01:37	Going in port-forward quarter of the stbd biobox in compartment #2.	15.43021	144.50349	4045	292	S5K10075.jpg
2016-12-12	01:38	Facing toward the west at 292 while sampling but will now turn southerly to waypoint #2.	15.43019	144.50349	4045	292	S5K10133.jpg
2016-12-12	01:40	Exploded pillow lava.	15.43021	144.50357	4042	172	2016-12-12T01_40_27.530782_S5K.jpg
2016-12-12	01:40	Pillow lavas no older than 4-years old.	15.43021	144.50359	4043	160	S5K10265.jpg
2016-12-12	01:42	Cool looking pillow tube.	15.43008	144.50368	4046	153	2016-12-12T01_42_02.536767_S5K.jpg
2016-12-12	01:43	Going down a slope obliquely.	15.42995	144.50374	4051	153	2016-12-12T01_43_13.535961_S5K.jpg
2016-12-12	01:44	Scarp.	15.42985	144.50378	4056	152	S5K10483.jpg
2016-12-12	01:44	Offset in map is about 50m. We are 50m north to the Sentry bathymetry.	15.42984	144.50377	4057	150	2016-12-12T01_44_44.533976_S5K.jpg
2016-12-12	01:45	Looking due south.	15.42978	144.50380	4058	198	1481507110747S5K10522.jpg
2016-12-12	01:45	Very steep escarpment.	15.42976	144.50381	4059	206	S5K10534.jpg
2016-12-12	01:45	Highlights on.	15.42975	144.50382	4061	209	S5K10545.jpg
2016-12-12	01:45	Lava pouring down the escarpment. Scarp existed prior to the eruption.	15.42976	144.50383	4061	214	1481507136851S5K10548.jpg
2016-12-12	01:46	Bill describes this as a lava waterfall-frozen in time.	15.42978	144.50378	4064	232	S5K10582.jpg
2016-12-12	01:47	Long tube of lava spilling down the scarp.	15.42982	144.50370	4070	248	S5K10628.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	01:47	Vertical wall of lava.	15.42983	144.50373	4075	248	2016-12-12T01_47_25.550783_S5K.jpg
2016-12-12	01:47	Intact and flowing downhill.	15.42984	144.50375	4078	254	2016-12-12T01_47_42.534107_S5K.jpg
2016-12-12	01:48	Pillow sticking out in mid-air.	15.42984	144.50376	4080	285	S5K10712.jpg
2016-12-12	01:48	Iron staining around edges of pillows (about 25cm across?).	15.42984	144.50376	4081	285	2016-12-12T01_48_26.554806_S5K.jpg
2016-12-12	01:48	A few pieces did break but amazingly intact.	15.42983	144.50377	4083	283	2016-12-12T01_48_48.541263_S5K.jpg
2016-12-12	01:49	Highlights off.	15.42979	144.50380	4093	285	2016-12-12T01_49_58.541974_S5K.jpg
2016-12-12	01:50	Lasers are on so can see how wide the tubes are. About 25-30cm.	15.42978	144.50380	4096	296	2016-12-12T01_50_17.524445_S5K.jpg
2016-12-12	01:50	More broken pieces.	15.42978	144.50379	4098	298	2016-12-12T01_50_37.554492_S5K.jpg
2016-12-12	01:51	Some hydrothermal staining sediments and broken tubes.	15.42978	144.50378	4101	296	S5K10875.jpg
2016-12-12	01:51	Iron deposits.	15.42978	144.50379	4102	296	2016-12-12T01_51_11.553942_S5K.jpg
2016-12-12	01:51	Scarp is starting to become less vertical as we near the bottom.	15.42976	144.50381	4102	299	2016-12-12T01_51_28.528050_S5K.jpg
2016-12-12	01:52	Broken cross-sections of pillows.	15.42975	144.50383	4108	297	2016-12-12T01_52_54.550561_S5K.jpg
2016-12-12	01:53	Broken pillow.	15.42975	144.50385	4109	297	S5K11035.jpg
2016-12-12	01:53	Highlights of fractured pillow.	15.42975	144.50385	4109	297	2016-12-12T01_53_47.547581_S5K.jpg
2016-12-12	01:55	Looking for some pillow-toes at the bottom of the larger pillow to sample.	15.42972	144.50387	4109	303	S5K11116.jpg
2016-12-12	01:56	Looking for a piece to sample.	15.42970	144.50386	4111	308	S5K11224.jpg
2016-12-12	01:59	Settling the ROV to sample one of these &"toes";.	15.42967	144.50389	4112	309	S5K11399.jpg
2016-12-12	02:02	S45-Geo-02 Lava toe from the base of a pillow. Taken near the base of the scarp south of waypoint #1.	15.42966	144.50392	4112	310	2016-12-12T02_02_51.561504_S5K.jpg
2016-12-12	02:04	Going into the port biobox in bin #7.	15.42964	144.50393	4112	312	2016-12-12T02_04_21.542873_S5K.jpg
2016-12-12	02:05	Turning counter clockwise to head SE to WP 2.	15.42962	144.50395	4111	300	2016-12-12T02_05_33.545384_S5K.jpg
2016-12-12	02:06	Facing S.	15.42960	144.50400	4114	180	S5K11803.jpg
2016-12-12	02:06	Another drop-off in front of us.	15.42956	144.50400	4115	170	2016-12-12T02_06_48.549267_S5K.jpg
2016-12-12	02:07	Going downhill.	15.42949	144.50405	4119	185	S5K11866.jpg
2016-12-12	02:09	Facing W, going S.	15.42934	144.50413	4130	265	2016-12-12T02_09_06.559637_S5K.jpg
2016-12-12	02:09	Some basalt tubes actually hanging in the water like stalagmites.	15.42931	144.50413	4133	265	2016-12-12T02_09_30.542395_S5K.jpg
2016-12-12	02:10	But didn't get the frame grab from it.	15.42925	144.50418	4138	324	1481508609969S5K12021.jpg
2016-12-12	02:11	Still going downhill, reaching a flatter area.	15.42924	144.50420	4152	223	2016-12-12T02_11_03.537138_S5K.jpg
2016-12-12	02:11	Mostly heading S.	15.42916	144.50413	4157	165	2016-12-12T02_11_36.536901_S5K.jpg
2016-12-12	02:12	Light hydrothermal sediment all over.	15.42892	144.50428	4161	156	2016-12-12T02_12_16.546718_S5K.jpg
2016-12-12	02:13	Heading SE.	15.42870	144.50445	4147	134	2016-12-12T02_13_36.565131_S5K.jpg
2016-12-12	02:14	Little mini-cone.	15.42862	144.50456	4141	133	2016-12-12T02_14_21.537921_S5K.jpg
2016-12-12	02:15	Top of mini-cone.	15.42854	144.50463	4132	139	2016-12-12T02_15_33.538141_S5K.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	02:16	Can see various &"dimples"; on the map. This is probably one of them. We are not by one on the map so some offset.	15.42856	144.50462	4133	150	2016-12-12T02_16_36.536597_S5K.jpg
2016-12-12	02:18	Can see top of cone in rear camera.	15.42847	144.50475	4139	116	2016-12-12T02_18_02.552079_S5K.jpg
2016-12-12	02:18	Going down the other side.	15.42848	144.50479	4141	117	S5K12515.jpg
2016-12-12	02:20	Heading S of E.	15.42840	144.50500	4144	122	2016-12-12T02_20_03.551377_S5K.jpg
2016-12-12	02:21	Thick hydrothermal sediment.	15.42834	144.50512	4135	127	2016-12-12T02_21_05.548465_S5K.jpg
2016-12-12	02:24	Waiting for the ship. Did not leave new lava between waypoint 1 & 2...all new!	15.42813	144.50517	4118	176	
2016-12-12	02:25	Facing south while waiting for the ship to move.	15.42813	144.50517	4118	177	2016-12-12T02_25_32.537672_S5K.jpg
2016-12-12	02:28	Large pillows and tubes and less hydrothermal-yellow staining deposits after the hill we came over.	15.42784	144.50514	4123	186	
2016-12-12	02:29	Starting to climb back up a hill.	15.42775	144.50510	4128	187	S5K13191.jpg
2016-12-12	02:30	Sediment has increased again.	15.42765	144.50507	4125	185	1481509803762S5K13215.jpg
2016-12-12	02:30	Slope is increasing and seeing old stains where water had flowed.	15.42757	144.50506	4122	175	2016-12-12T02_30_20.557642_S5K.jpg
2016-12-12	02:30	Shiny pillow surfaces.	15.42750	144.50515	4118	160	S5K13265.jpg
2016-12-12	02:31	Glassy pillows and some with striations.	15.42747	144.50521	4115	159	S5K13279.jpg
2016-12-12	02:31	Large pillows with warts.	15.42740	144.50523	4111	159	2016-12-12T02_31_31.565689_S5K.jpg
2016-12-12	02:32	Ship has gotten too close to the ROV so we need to maneuver off the bottom.	15.42734	144.50525	4101	181	
2016-12-12	02:32	Had to move off course a bit to stay out of the way of the ship.	15.42727	144.50515	4096	213	
2016-12-12	02:33	Moving out of the circle of safety/death.	15.42720	144.50506	4092	220	
2016-12-12	02:36	Bottom coming back into view. Ship is moving away a bit. We are offset now to the west of our initial track but will now go to Waypoint #3.	15.42752	144.50489	4130	185	2016-12-12T02_36_49.542594_S5K.jpg
2016-12-12	02:37	Pillows with lots of nubs or warts on them.	15.42746	144.50495	4128	169	2016-12-12T02_37_42.571714_S5K.jpg
2016-12-12	02:38	Hill ahead of us.	15.42740	144.50499	4126	168	2016-12-12T02_38_20.576589_S5K.jpg
2016-12-12	02:38	Having a few rain squalls with the wind about 25kts.	15.42736	144.50502	4121	161	2016-12-12T02_38_54.575922_S5K.jpg
2016-12-12	02:39	Pillows and flow is very intact with not much looking easy to sample.	15.42729	144.50506	4119	170	2016-12-12T02_39_20.562885_S5K.jpg
2016-12-12	02:39	Keeping outside the 50m radius of the ship on our way to waypoint #3.	15.42720	144.50509	4117	186	S5K13802.jpg
2016-12-12	02:41	Flying a bit high off the bottom.	15.42683	144.50505	4102	164	S5K13918.jpg
2016-12-12	02:42	Ship is pulling on the tether.	15.42677	144.50505	4098	174	
2016-12-12	02:42	HD new file started.	15.42684	144.50505	4103	184	S5K13983.jpg
2016-12-12	02:43	Coming back down.	15.42687	144.50504	4102	185	2016-12-12T02_43_09.564334_S5K.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	02:43	Facing up a hill with striated pillows and some glassy nubs.	15.42692	144.50503	4110	183	2016-12-12T02_43_55.582529_S5K.jpg
2016-12-12	02:45	No biology evident.	15.42664	144.50500	4102	181	2016-12-12T02_45_23.565521_S5K.jpg
2016-12-12	02:46	Can see how elastic the flow was coming out of the pillow that is cracked.	15.42664	144.50500	4106	180	S5K14183.jpg
2016-12-12	02:46	Will attempt to sample the broken crust of this pillow.	15.42663	144.50502	4106	185	2016-12-12T02_46_38.594474_S5K.jpg
2016-12-12	02:47	Ship is pulling the tether.	15.42665	144.50502	4107	179	
2016-12-12	02:49	S435-Geo-03 Piece of crust from the pillow taken going up the slope toward waypoint #3. Taken with stbd arm. In compartment #1 of the stbd-milk crate.	15.42663	144.50501	4107	188	2016-12-12T02_49_21.581462_S5K.jpg
2016-12-12	02:52	Moving ahead to keep up with the ship while trying to close the biobox lid.	15.42627	144.50489	4106	185	2016-12-12T02_52_17.576462_S5K.jpg
2016-12-12	02:53	Been moving due south while ROV was fixing the basket.	15.42613	144.50495	4104	189	
2016-12-12	02:53	Lots of hydrothermal sediment here.	15.42606	144.50503	4107	192	S5K14633.jpg
2016-12-12	02:54	Going up a slight hill.	15.42596	144.50492	4111	186	S5K14684.jpg
2016-12-12	02:58	Going up a hill again.	15.42572	144.50528	4101	174	2016-12-12T02_58_54.582207_S5K.jpg
2016-12-12	02:59	Lots of sediments and long tubes.	15.42564	144.50536	4095	187	2016-12-12T02_59_11.569001_S5K.jpg
2016-12-12	03:01	Tether has pulling ROV extensively as it moves south. Pilots believe the vehicle has been going back and forth.	15.42566	144.50542	4098	181	2016-12-12T03_01_59.564992_S5K.jpg
2016-12-12	03:02	Thick sediment as approach waypoint #3.	15.42544	144.50541	4092	177	2016-12-12T03_02_49.585601_S5K.jpg
2016-12-12	03:03	Hollow pillow.	15.42525	144.50540	4084	177	2016-12-12T03_03_44.574019_S5K.jpg
2016-12-12	03:04	Scaleworm swimming by.	15.42521	144.50540	4082	177	2016-12-12T03_04_00.587581_S5K.jpg
2016-12-12	03:04	Another scaleworm.	15.42498	144.50534	4076	211	
2016-12-12	03:05	Fingers and nubs.	15.42495	144.50529	4074	209	2016-12-12T03_05_13.595702_S5K.jpg
2016-12-12	03:06	Thick sediment between pillows.	15.42486	144.50521	4069	207	2016-12-12T03_06_16.583841_S5K.jpg
2016-12-12	03:07	Another possible scaleworm swam by.	15.42473	144.50521	4061	204	S5K15437.jpg
2016-12-12	03:08	At the waypoint #3 target and scanning around for any warm water.	15.42467	144.50523	4059	181	S5K15508.jpg
2016-12-12	03:09	Sharp drop in the ORP sensor.	15.42467	144.50526	4058	205	S5K15558.jpg
2016-12-12	03:10	Scanning around the area before heading west.	15.42475	144.50529	4065	205	2016-12-12T03_10_35.589962_S5K.jpg
2016-12-12	03:11	Glassy pillows with sediment.	15.42472	144.50529	4065	178	2016-12-12T03_11_54.603508_S5K.jpg
2016-12-12	03:12	Facing uphill.	15.42467	144.50529	4064	180	1481512336755S5K15748.jpg
2016-12-12	03:12	Large tube.	15.42465	144.50529	4064	180	2016-12-12T03_12_27.597708_S5K.jpg
2016-12-12	03:12	Drop in ORP but we are closer to the bottom.	15.42461	144.50530	4063	180	1481512361652S5K15773.jpg
2016-12-12	03:13	Big ORP drop.	15.42454	144.50530	4062	180	2016-12-12T03_13_05.605114_S5K.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	03:13	Temperature and ORP went up but not seeing any evidence of flow.	15.42448	144.50529	4060	180	2016-12-12T03_13_37.601044_S5K.jpg
2016-12-12	03:14	Sea cucumber.	15.42449	144.50529	4058	244	2016-12-12T03_14_16.571171_S5K.jpg
2016-12-12	03:14	Purple sea cucumber.	15.42448	144.50527	4059	247	2016-12-12T03_14_37.610568_S5K.jpg
2016-12-12	03:15	Took a closer look and now continuing uphill.	15.42447	144.50528	4058	247	S5K15935.jpg
2016-12-12	03:16	Lavas here are less nubby.	15.42442	144.50518	4055	247	S5K15993.jpg
2016-12-12	03:16	Or less warts.	15.42440	144.50513	4054	247	2016-12-12T03_16_44.589451_S5K.jpg
2016-12-12	03:17	Smooth and flatter lavas as we near the top of this mound.	15.42435	144.50502	4051	247	S5K16080.jpg
2016-12-12	03:18	Shrimp.	15.42434	144.50499	4052	247	2016-12-12T03_18_02.603028_S5K.jpg
2016-12-12	03:18	Came through waypoint #4.	15.42437	144.50494	4051	247	2016-12-12T03_18_27.587564_S5K.jpg
2016-12-12	03:19	Scanning around to north.	15.42442	144.50491	4048	320	2016-12-12T03_19_21.579670_S5K.jpg
2016-12-12	03:19	Heading back NW to a lighter staining.	15.42445	144.50490	4048	319	S5K16188.jpg
2016-12-12	03:20	Hole in the lava.... a window.	15.42448	144.50485	4050	321	2016-12-12T03_20_13.601811_S5K.jpg
2016-12-12	03:20	Nothing inside the pillow.	15.42449	144.50480	4048	336	2016-12-12T03_20_50.607916_S5K.jpg
2016-12-12	03:22	Going to head southwest.	15.42452	144.50481	4047	283	S5K16348.jpg
2016-12-12	03:22	Smoother flow and flatter.	15.42452	144.50482	4049	235	S5K16363.jpg
2016-12-12	03:24	Small temperature spikes on the MAPR.;	15.42427	144.50471	4051	211	S5K16500.jpg
2016-12-12	03:25	Water may have been slightly murky back there but hard to tell.	15.42423	144.50469	4050	210	S5K16518.jpg
2016-12-12	03:25	Going to zig-zag a bit.	15.42419	144.50468	4052	230	2016-12-12T03_25_31.577373_S5K.jpg
2016-12-12	03:26	Little pillow explosion.	15.42424	144.50464	4050	312	2016-12-12T03_26_11.580869_S5K.jpg
2016-12-12	03:26	Heading NW with big, glassy pillows and sediment.	15.42431	144.50457	4051	312	2016-12-12T03_26_37.577658_S5K.jpg
2016-12-12	03:27	Small explosion again.	15.42439	144.50448	4051	311	S5K16637.jpg
2016-12-12	03:27	Squat lobster!	15.42442	144.50448	4049	314	S5K16675.jpg
2016-12-12	03:28	Going to peak in the hole.	15.42441	144.50451	4049	320	S5K16711.jpg
2016-12-12	03:29	Nothing going on in the hole and that is a lonely squat lobster.	15.42444	144.50447	4049	319	S5K16775.jpg
2016-12-12	03:29	ORP is dropping.	15.42447	144.50443	4051	315	S5K16806.jpg
2016-12-12	03:30	ORP is really dropping in this thickly coated sediment flow.	15.42456	144.50435	4052	315	2016-12-12T03_30_40.596185_S5K.jpg
2016-12-12	03:31	End of the NW zig-zag and turn back south.	15.42466	144.50427	4055	248	S5K16905.jpg
2016-12-12	03:31	Another scaleworm swam by.	15.42462	144.50427	4054	205	S5K16927.jpg
2016-12-12	03:32	Very thick sediment and ORP leveling off.	15.42453	144.50425	4055	204	S5K16954.jpg
2016-12-12	03:32	ORP dropping again as we come back south.	15.42441	144.50421	4057	204	2016-12-12T03_32_56.591241_S5K.jpg
2016-12-12	03:33	Going downslope.	15.42425	144.50415	4062	204	S5K17026.jpg
2016-12-12	03:33	ORP came back up.	15.42419	144.50413	4064	204	2016-12-12T03_33_50.612512_S5K.jpg
2016-12-12	03:34	Bottom of the south zig-zag and turning back NW.	15.42417	144.50412	4063	278	
2016-12-12	03:34	Crisscrossing our way to waypoint #5.	15.42423	144.50404	4062	315	S5K17100.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	03:35	Less sediment here and looking downhill to the left.	15.42426	144.50402	4066	316	S5K17117.jpg
2016-12-12	03:36	Broken tube on the NW zigzag.	15.42445	144.50389	4069	316	2016-12-12T03_36_31.608200_S5K.jpg
2016-12-12	03:37	Hard to look downhill.	15.42454	144.50382	4071	317	2016-12-12T03_37_12.615425_S5K.jpg
2016-12-12	03:37	Steep slope.	15.42457	144.50379	4073	317	2016-12-12T03_37_36.604103_S5K.jpg
2016-12-12	03:37	Going to turn back SW.	15.42458	144.50378	4073	311	2016-12-12T03_37_52.586997_S5K.jpg
2016-12-12	03:38	Thruster dust and pillow toes.	15.42457	144.50382	4072	207	2016-12-12T03_38_43.615770_S5K.jpg
2016-12-12	03:39	Heading SW to the waypoint #5.	15.42445	144.50378	4072	207	S5K17387.jpg
2016-12-12	03:40	ORP is gradually climbing as we go downhill with a lot of hydrothermal sediment.	15.42440	144.50377	4074	208	S5K17412.jpg
2016-12-12	03:41	Heavy sediment again and drop in ORP.	15.42427	144.50365	4085	311	S5K17516.jpg
2016-12-12	03:42	Climbing up a slope that is coming from east to west.	15.42430	144.50360	4087	310	2016-12-12T03_42_04.615411_S5K.jpg
2016-12-12	03:42	Exploded pieces.	15.42431	144.50353	4090	326	2016-12-12T03_42_35.611656_S5K.jpg
2016-12-12	03:43	Getting more warts in the pillows.	15.42434	144.50350	4092	324	2016-12-12T03_43_17.627530_S5K.jpg
2016-12-12	03:43	Just east of waypoint #5 (offset in bathy).	15.42434	144.50344	4093	350	2016-12-12T03_43_44.616576_S5K.jpg
2016-12-12	03:44	Steep slope as we face due north.	15.42443	144.50337	4097	358	S5K17697.jpg
2016-12-12	03:45	Dripping hydrothermal sediments.	15.42445	144.50335	4099	13	2016-12-12T03_45_05.606068_S5K.jpg
2016-12-12	03:46	Going to try to get a sample from here.	15.42448	144.50340	4098	44	2016-12-12T03_46_13.612091_S5K.jpg
2016-12-12	03:46	Map has the ROV about 15-20m north of waypoint #5.	15.42448	144.50340	4097	39	S5K17806.jpg
2016-12-12	03:47	Many good pieces to choose from.	15.42447	144.50340	4098	41	S5K17839.jpg
2016-12-12	03:47	Looks like a claw from a hawk.	15.42447	144.50339	4099	42	2016-12-12T03_47_36.628741_S5K.jpg
2016-12-12	03:48	Bringing out the port arm.	15.42446	144.50338	4099	41	2016-12-12T03_48_11.637252_S5K.jpg
2016-12-12	03:49	Pilot Russ is working the arm.	15.42445	144.50335	4099	40	1481514553915S5K17965.jpg
2016-12-12	03:50	S45-Geo-04 Lava sample from a claw-like finger taken near waypoint #5 on a hill. Going in the port forward crate and piece went into compartment #10. Looks like a toe.	15.42443	144.50331	4099	40	S5K18014.jpg
2016-12-12	03:51	Piece fell off into box 10, port milk crate.	15.42443	144.50337	4098	41	S5K18097.jpg
2016-12-12	03:52	Trying to get the other piece into box 9.	15.42441	144.50340	4098	39	2016-12-12T03_52_10.620997_S5K.jpg
2016-12-12	03:52	Remainder went into bin #9.	15.42437	144.50342	4098	335	
2016-12-12	03:53	Next will head west to waypoint #6.	15.42438	144.50339	4098	294	
2016-12-12	03:54	Looking for the edge of the new flow. Want to sample a piece of old lava.	15.42437	144.50336	4103	257	
2016-12-12	03:55	Looking south.	15.42427	144.50325	4112	188	2016-12-12T03_55_53.602066_S5K.jpg
2016-12-12	03:56	Heading south but moving west to look at the steep slope.	15.42416	144.50323	4115	190	2016-12-12T03_56_26.613293_S5K.jpg
2016-12-12	03:56	HD new file started.	15.42412	144.50319	4115	177	2016-12-12T03_56_40.627939_S5K.jpg
2016-12-12	03:57	Anemone.	15.42409	144.50315	4113	175	S5K18433.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	03:57	This could be older and pelagic sediment. Did not see the contact.	15.42402	144.50310	4114	189	2016-12-12T03_57_29.612467_S5K.jpg
2016-12-12	03:57	Having to stay clear of the ship so have some navigational limitations.	15.42401	144.50304	4113	203	S5K18480.jpg
2016-12-12	03:58	Moving NW away from the ship.	15.42401	144.50297	4112	280	
2016-12-12	03:58	Can't see as we are facing down a steep slope.	15.42409	144.50293	4114	323	
2016-12-12	03:59	Heading toward waypoint #6 to the NW but high off bottom.	15.42412	144.50294	4126	322	
2016-12-12	04:00	Letting out tether.	15.42421	144.50291	4128	322	
2016-12-12	04:01	Brief view of some glassy lava but some older looking patches of older lavas.	15.42420	144.50292	4133	322	2016-12-12T04_01_27.619635_S5K.jpg
2016-12-12	04:02	Older looking on the left and new to the right.	15.42422	144.50290	4137	331	2016-12-12T04_02_14.634827_S5K.jpg
2016-12-12	04:02	Contact?	15.42422	144.50287	4138	348	2016-12-12T04_02_55.648979_S5K.jpg
2016-12-12	04:04	Definitely looks older but not seeing an easy piece to sample.	15.42420	144.50286	4137	330	2016-12-12T04_04_20.624076_S5K.jpg
2016-12-12	04:05	Looking for an older piece of flow to sample.	15.42426	144.50281	4139	319	2016-12-12T04_05_17.629015_S5K.jpg
2016-12-12	04:05	No biology on this flow either.	15.42426	144.50281	4140	323	2016-12-12T04_05_56.634930_S5K.jpg
2016-12-12	04:06	Preparing to sample the older flow.	15.42426	144.50281	4140	319	2016-12-12T04_06_40.642942_S5K.jpg
2016-12-12	04:08	S45-Geo-05 Piece from the top crust of an older pillow. Taken at the contact between the new flow and older flow about 10m SW of waypoint #6.	15.42426	144.50275	4140	319	S5K19145.jpg
2016-12-12	04:10	Placing sample in bin #8 on the port-forward milk crate.	15.42428	144.50266	4140	320	2016-12-12T04_10_28.635141_S5K.jpg
2016-12-12	04:12	Scaleworm was swimming by while putting the arm away.	15.42429	144.50250	4140	320	2016-12-12T04_11_57.654655_S5K.jpg
2016-12-12	04:12	Before driving off going to look at the contact between old and new flows to the east.	15.42435	144.50271	4140	321	S5K19369.jpg
2016-12-12	04:13	Turning to port.	15.42435	144.50271	4139	301	2016-12-12T04_13_37.656158_S5K.jpg
2016-12-12	04:13	Old flow.	15.42435	144.50272	4140	286	S5K19439.jpg
2016-12-12	04:14	Looking SW at older flow.	15.42434	144.50269	4139	235	2016-12-12T04_14_16.626763_S5K.jpg
2016-12-12	04:14	Looking south and seeing stalked coral in the older flow.	15.42431	144.50268	4138	189	2016-12-12T04_14_48.632405_S5K.jpg
2016-12-12	04:15	Looking SE at older flow.	15.42430	144.50267	4138	143	2016-12-12T04_15_09.654906_S5K.jpg
2016-12-12	04:15	Looking east at the new flow contact.	15.42430	144.50265	4138	106	2016-12-12T04_15_22.629069_S5K.jpg
2016-12-12	04:15	Contact point.	15.42432	144.50266	4138	102	2016-12-12T04_15_34.639160_S5K.jpg
2016-12-12	04:15	New lava!	15.42432	144.50266	4138	102	S5K19547.jpg
2016-12-12	04:15	New flow draping over old flow.	15.42432	144.50266	4138	102	2016-12-12T04_15_44.650645_S5K.jpg
2016-12-12	04:16	Many new toes coming out of the flow.	15.42436	144.50265	4137	102	2016-12-12T04_16_46.651320_S5K.jpg
2016-12-12	04:17	Turning SE to head for waypoint #7.	15.42436	144.50264	4137	102	2016-12-12T04_17_00.667838_S5K.jpg
2016-12-12	04:17	New tubes draping over old lavas.	15.42437	144.50261	4136	132	2016-12-12T04_17_49.653593_S5K.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	04:18	Thinner flow so less hydrothermal deposits.	15.42437	144.50259	4136	128	2016-12-12T04_18_15.641988_S5K.jpg
2016-12-12	04:19	Stalked glass sponge.	15.42443	144.50279	4134	139	2016-12-12T04_19_20.637391_S5K.jpg
2016-12-12	04:19	Sponge.	15.42443	144.50279	4134	139	S5K19773.jpg
2016-12-12	04:19	Could be on an older pillow at the contact of the new flow surround it.	15.42443	144.50277	4134	139	2016-12-12T04_19_45.677608_S5K.jpg
2016-12-12	04:20	Seem to be along the edge of the flow.	15.42443	144.50277	4133	138	S5K19826.jpg
2016-12-12	04:20	Anemone on older adjacent to the new lava.	15.42443	144.50277	4131	139	S5K19840.jpg
2016-12-12	04:20	Seem to be parallel to the new flow with toes of new lavas.	15.42443	144.50278	4129	138	2016-12-12T04_20_54.669596_S5K.jpg
2016-12-12	04:21	Crinoids or brittle stars.	15.42443	144.50279	4127	139	2016-12-12T04_21_15.654209_S5K.jpg
2016-12-12	04:21	Ophiuroids?	15.42443	144.50279	4127	138	2016-12-12T04_21_18.662737_S5K.jpg
2016-12-12	04:21	All older lavas.	15.42444	144.50277	4125	136	2016-12-12T04_21_46.651346_S5K.jpg
2016-12-12	04:22	Moving SE.	15.42444	144.50278	4123	134	2016-12-12T04_22_02.669418_S5K.jpg
2016-12-12	04:22	Anemone.	15.42417	144.50299	4122	145	2016-12-12T04_22_13.650575_S5K.jpg
2016-12-12	04:22	Older tubes and pillows as we climb sideways up a slope.	15.42414	144.50299	4119	151	2016-12-12T04_22_40.644004_S5K.jpg
2016-12-12	04:23	That was a brittle star.	15.42416	144.50321	4115	154	2016-12-12T04_23_16.636629_S5K.jpg
2016-12-12	04:23	Top of a pile with an anemone.	15.42421	144.50330	4111	156	2016-12-12T04_23_52.646219_S5K.jpg
2016-12-12	04:24	Another brittle star.	15.42416	144.50331	4108	157	2016-12-12T04_24_36.652299_S5K.jpg
2016-12-12	04:25	ROV navigation made a big jump when switched to USBL...ignore.	15.42413	144.50333	4106	156	S5K20117.jpg
2016-12-12	04:26	Overview of older flow.	15.42369	144.50334	4101	165	2016-12-12T04_26_01.634588_S5K.jpg
2016-12-12	04:26	ROV navigation jumped back on to the original trackline.	15.42363	144.50341	4101	161	S5K20229.jpg
2016-12-12	04:27	Flutter and more sediment on these older flows.	15.42361	144.50342	4100	156	2016-12-12T04_27_18.641769_S5K.jpg
2016-12-12	04:27	Flat lobate flow.	15.42356	144.50346	4100	155	2016-12-12T04_27_55.656136_S5K.jpg
2016-12-12	04:28	Pelagic sediment coating the flutter flow.	15.42354	144.50347	4100	154	2016-12-12T04_28_16.640590_S5K.jpg
2016-12-12	04:29	Heading SE over this older flow.	15.42350	144.50344	4100	147	S5K20382.jpg
2016-12-12	04:30	Very few animals on this flow.	15.42345	144.50343	4100	145	2016-12-12T04_30_01.645181_S5K.jpg
2016-12-12	04:31	Stalked glass sponge.	15.42333	144.50347	4097	144	2016-12-12T04_31_22.666642_S5K.jpg
2016-12-12	04:31	Sponge.	15.42333	144.50347	4097	144	2016-12-12T04_31_24.671620_S5K.jpg
2016-12-12	04:32	Rat tail.	15.42326	144.50342	4095	138	2016-12-12T04_32_26.656616_S5K.jpg
2016-12-12	04:32	Rattail fish.	15.42329	144.50365	4094	137	S5K20560.jpg
2016-12-12	04:33	Sponge and scaleworm.	15.42317	144.50382	4092	140	2016-12-12T04_33_21.646260_S5K.jpg
2016-12-12	04:33	Scale worm.	15.42316	144.50382	4091	143	2016-12-12T04_33_47.683031_S5K.jpg
2016-12-12	04:34	Big pillow pile in the flutter flow.	15.42314	144.50383	4091	136	2016-12-12T04_34_22.677186_S5K.jpg
2016-12-12	04:34	Sediment is thickening.	15.42311	144.50385	4091	133	2016-12-12T04_34_46.668576_S5K.jpg
2016-12-12	04:35	Rounder pillows with sediment and only an occasionally animal.	15.42310	144.50389	4090	134	1481517313827S5K20725.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	04:35	These older pillows still have remnants of hydrothermal staining.	15.42306	144.50394	4087	146	S5K20764.jpg
2016-12-12	04:36	Passed another glass sponge.	15.42305	144.50394	4087	145	2016-12-12T04_36_03.687705_S5K.jpg
2016-12-12	04:36	STBD arm started to droop.	15.42308	144.50394	4085	146	2016-12-12T04_36_35.669224_S5K.jpg
2016-12-12	04:37	Going up a hill and seeing less sediment on older pillows.	15.42299	144.50393	4083	150	2016-12-12T04_37_22.661188_S5K.jpg
2016-12-12	04:37	Very small rattails fish.	15.42297	144.50394	4082	150	2016-12-12T04_37_37.682492_S5K.jpg
2016-12-12	04:38	Going up slope and seeing some more brittle stars and anemone.	15.42295	144.50396	4080	155	2016-12-12T04_38_46.675841_S5K.jpg
2016-12-12	04:40	Coming up an older pillow flow. Should be a climb of 60m.	15.42283	144.50399	4075	161	S5K21025.jpg
2016-12-12	04:40	Another sponge.	15.42277	144.50401	4072	160	S5K21056.jpg
2016-12-12	04:41	Slope is flattening out.	15.42274	144.50400	4069	154	2016-12-12T04_41_26.672712_S5K.jpg
2016-12-12	04:41	Sediment is increasing in the flatter terrain.	15.42271	144.50399	4068	152	1481517708153S5K21119.jpg
2016-12-12	04:42	Surprisingly few animals.	15.42265	144.50402	4067	152	S5K21151.jpg
2016-12-12	04:43	Broken skins on old pillows with a lot of sediment.	15.42254	144.50408	4067	146	2016-12-12T04_43_42.675192_S5K.jpg
2016-12-12	04:44	Some old remnants of hydrothermal staining.	15.42244	144.50412	4067	147	2016-12-12T04_44_27.692887_S5K.jpg
2016-12-12	04:44	Broken lobe.	15.42239	144.50416	4066	146	2016-12-12T04_44_46.667546_S5K.jpg
2016-12-12	04:46	Flat and heavy sediment.	15.42232	144.50421	4066	165	S5K21412.jpg
2016-12-12	04:47	Gradually going upslope and less sediment.	15.42226	144.50422	4066	160	S5K21433.jpg
2016-12-12	04:47	Just a small hill as we are headed downhill again.	15.42222	144.50424	4066	152	S5K21456.jpg
2016-12-12	04:48	Passed a lonely shrimp.	15.42214	144.50427	4065	148	2016-12-12T04_47_59.669929_S5K.jpg
2016-12-12	04:48	Climbing upslope again and longer tubes.	15.42207	144.50430	4065	143	S5K21525.jpg
2016-12-12	04:49	More massive pillows and tubes.	15.42203	144.50430	4062	146	S5K21574.jpg
2016-12-12	04:50	Need to wait for ship and tether so will take advantage of stopping to take a sample.	15.42201	144.50429	4061	152	2016-12-12T04_50_08.670879_S5K.jpg
2016-12-12	04:50	Will try for some crust of this pillow.	15.42200	144.50424	4062	130	2016-12-12T04_50_43.681883_S5K.jpg
2016-12-12	04:51	One shrimp swimming around the pillow.	15.42191	144.50421	4062	129	2016-12-12T04_51_41.691398_S5K.jpg
2016-12-12	04:52	Winds are now at 30kts and consistent. Why??	15.42188	144.50420	4062	126	S5K21736.jpg
2016-12-12	04:53	Landing for a sample.	15.42188	144.50419	4062	112	2016-12-12T04_53_08.683649_S5K.jpg
2016-12-12	04:53	Will instead get a piece of crust that has fallen down.	15.42186	144.50417	4063	112	2016-12-12T04_53_39.687223_S5K.jpg
2016-12-12	04:54	Going for the triangular shaped piece.	15.42183	144.50415	4063	112	S5K21862.jpg
2016-12-12	04:54	S45-Geo-06 Grabbed a triangular piece of older pillow crust due west of Waypoint #7 (navigation jumps). Sample went into bin #3 in the STBD milk crate.	15.42183	144.50415	4063	112	S5K21883.jpg
2016-12-12	04:55	Into stbd crate no. 3.	15.42183	144.50415	4063	112	2016-12-12T04_55_56.683780_S5K.jpg
2016-12-12	04:56	Going to get an additional piece of this crust from the same pile of pieces.	15.42183	144.50415	4063	112	S5K22008.jpg

Date	Time	S45 - New Lava Flow - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-12	04:57	Shrimp continues to be swimming just outside the larger pillow.	15.42183	144.50415	4063	112	
2016-12-12	04:58	Repositioning for another piece.	15.42183	144.50415	4062	112	S5K22097.jpg
2016-12-12	04:59	Another piece.	15.42183	144.50415	4063	107	2016-12-12T04_59_28.698791_S5K.jpg
2016-12-12	05:00	Another piece of this sample from the older flow.	15.42183	144.50415	4063	107	1481518801991S5K22213.jpg
2016-12-12	05:00	Placed in bin #3 of the stbd biobox.	15.42183	144.50415	4063	107	2016-12-12T05_00_15.677185_S5K.jpg
2016-12-12	05:01	Grabbing another piece of this sample.	15.42183	144.50415	4063	107	2016-12-12T05_01_23.680979_S5K.jpg
2016-12-12	05:02	Floating creature.	15.42227	144.50383	4063	108	S5K22371.jpg
2016-12-12	05:02	That was not a shrimp.	15.42243	144.50381	4063	108	2016-12-12T05_02_53.703354_S5K.jpg
2016-12-12	05:04	Another sample for bin #3.	15.42259	144.50383	4063	108	2016-12-12T05_04_11.674703_S5K.jpg
2016-12-12	05:04	Little white critters living on the face of the rock.	15.42248	144.50388	4063	108	2016-12-12T05_04_41.687743_S5K.jpg
2016-12-12	05:05	Two arm sampling.	15.42236	144.50393	4063	108	2016-12-12T05_05_12.675419_S5K.jpg
2016-12-12	05:05	A sampling extravaganza.	15.42221	144.50395	4063	107	S5K22544.jpg
2016-12-12	05:06	Manipulator training.	15.42209	144.50398	4063	108	2016-12-12T05_06_21.676338_S5K.jpg
2016-12-12	05:06	Coming off the bottom. Winds are steady at 30kts.	15.42204	144.50400	4061	116	2016-12-12T05_06_47.694606_S5K.jpg

Table 6.6-12 Dive S47 – Perseverance

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	06:12	Bottom in sight!	15.47843	144.50803	3903	329	
2016-12-16	06:12	Lots of sediment and it is very yellow!	15.47843	144.50804	3907	325	1481868738596S5K11395.jpg
2016-12-16	06:12	It is very crusty and yellow.	15.47844	144.50804	3909	327	2016-12-16T06_12_39.151463_S5K.jpg
2016-12-16	06:13	An anemone.	15.47847	144.50803	3909	340	1481868798272S5K11455.jpg
2016-12-16	06:13	Looks like a sulfur crust that has dried.	15.47847	144.50802	3910	339	2016-12-16T06_13_44.139374_S5K.jpg
2016-12-16	06:15	Here's a chimney.	15.47850	144.50801	3909	340	1481868917447S5K11574.jpg
2016-12-16	06:15	Super cool.	15.47850	144.50797	3910	337	2016-12-16T06_15_45.171958_S5K.jpg
2016-12-16	06:16	Looks old and inactive.	15.47853	144.50793	3908	336	2016-12-16T06_16_23.172178_S5K.jpg
2016-12-16	06:16	Old and oxidized with an anemone on the top.	15.47852	144.50790	3910	335	2016-12-16T06_16_46.173182_S5K.jpg
2016-12-16	06:17	Looks like a squat lobster as well on the chimney.	15.47854	144.50792	3909	333	1481869067334S5K11724.jpg
2016-12-16	06:18	Pillow lobes covered in sediment.	15.47856	144.50797	3911	36	1481869103402S5K11760.jpg
2016-12-16	06:19	Very crusty bottom in some places.	15.47853	144.50803	3910	124	2016-12-16T06_19_22.164606_S5K.jpg
2016-12-16	06:19	Then transitions into lobates covered in sediment.	15.47851	144.50806	3909	113	2016-12-16T06_19_37.169902_S5K.jpg
2016-12-16	06:20	A few scattered squat lobsters.	15.47849	144.50813	3909	11	2016-12-16T06_20_10.171763_S5K.jpg
2016-12-16	06:20	Pillows with scattered yellow and crusty staining.	15.47860	144.50813	3908	357	1481869246468S5K11903.jpg
2016-12-16	06:21	Heading north and some squat lobsters.	15.47868	144.50809	3909	356	1481869274394S5K11931.jpg
2016-12-16	06:21	Anemone and squat lobsters with another pile of hydrothermal material.	15.47873	144.50807	3909	356	2016-12-16T06_21_39.163797_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	06:22	Incredible hydrothermal material.	15.47883	144.50809	3909	356	1481869357331S5K12014.jpg
2016-12-16	06:22	Highlights on and off after 1 minute. Going over old sulfide? oxide? crust.	15.47883	144.50809	3909	356	2016-12-16T06_22_38.156608_S5K.jpg
2016-12-16	06:22	No ORP signal.	15.47885	144.50809	3909	356	2016-12-16T06_22_51.165986_S5K.jpg
2016-12-16	06:23	Pillow covered in sediment.	15.47892	144.50808	3909	358	1481869401406S5K12058.jpg
2016-12-16	06:24	Sea star.	15.47897	144.50804	3908	236	2016-12-16T06_23_59.166716_S5K.jpg
2016-12-16	06:25	Chimneys!	15.47870	144.50788	3912	186	2016-12-16T06_25_45.176167_S5K.jpg
2016-12-16	06:26	A field of dead chimneys with a few anemones.	15.47867	144.50784	3913	170	2016-12-16T06_26_05.166598_S5K.jpg
2016-12-16	06:30	We are offset in depth from our Sentry data by over 15m. Going to head west to find the scarp to get oriented to the map.	15.47853	144.50772	3917	252	2016-12-16T06_30_34.170568_S5K.jpg
2016-12-16	06:31	Heavy sediment.	15.47854	144.50775	3918	268	2016-12-16T06_31_25.186411_S5K.jpg
2016-12-16	06:31	More chimneys but inactive.	15.47863	144.50772	3919	271	2016-12-16T06_31_53.178593_S5K.jpg
2016-12-16	06:32	Used to be a very active area.	15.47861	144.50770	3919	276	2016-12-16T06_32_12.163707_S5K.jpg
2016-12-16	06:33	Long tubes covered in sediment.	15.47856	144.50761	3923	257	2016-12-16T06_33_59.165017_S5K.jpg
2016-12-16	06:34	Fish!	15.47856	144.50756	3924	260	1481870058271S5K12715.jpg
2016-12-16	06:35	Flying a bit high off bottom.	15.47854	144.50747	3922	263	
2016-12-16	06:35	Approaching another chimney.	15.47856	144.50750	3924	257	2016-12-16T06_35_38.161095_S5K.jpg
2016-12-16	06:36	Ship is moving and we are being yanked by the tether.	15.47857	144.50748	3926	267	2016-12-16T06_36_39.157465_S5K.jpg
2016-12-16	06:37	Nubs on pillows with sediment and hydrothermal deposits.	15.47863	144.50734	3936	298	2016-12-16T06_37_42.155052_S5K.jpg
2016-12-16	06:38	Mound of pillows.	15.47870	144.50717	3938	302	1481870316304S5K12973.jpg
2016-12-16	06:39	Fractured pillow.	15.47870	144.50712	3938	301	2016-12-16T06_39_19.193137_S5K.jpg
2016-12-16	06:41	Still moving to the west.	15.47866	144.50697	3938	294	2016-12-16T06_41_46.162992_S5K.jpg
2016-12-16	06:42	We are arriving at the fissure.	15.47865	144.50683	3936	273	2016-12-16T06_42_55.174498_S5K.jpg
2016-12-16	06:44	We are offset with the Sentry bathy by 60m to the north.	15.47865	144.50678	3936	282	2016-12-16T06_44_04.178065_S5K.jpg
2016-12-16	06:44	Following the fissure.	15.47868	144.50675	3935	320	
2016-12-16	06:44	Sentry appears further south on the map than Sentry but e-w doesn't look like much of an offset	15.47870	144.50674	3935	325	2016-12-16T06_44_47.190599_S5K.jpg
2016-12-16	06:45	Sea stars and broken pillows.	15.47880	144.50671	3930	324	1481870740446S5K13397.jpg
2016-12-16	06:46	Brittle star.	15.47883	144.50670	3926	325	2016-12-16T06_46_08.169161_S5K.jpg
2016-12-16	06:46	Odd lonely basalt walls.	15.47885	144.50671	3926	320	2016-12-16T06_46_21.180915_S5K.jpg
2016-12-16	06:47	Impressive stack of pillows.	15.47888	144.50679	3920	318	2016-12-16T06_47_25.183003_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	06:47	Tubular.	15.47888	144.50679	3918	317	2016-12-16T06_47_45.203350_S5K.jpg
2016-12-16	06:48	Cool layers in the pillows.	15.47888	144.50683	3915	315	1481870916310S5K13573.jpg
2016-12-16	06:49	Fissure.	15.47896	144.50682	3911	318	2016-12-16T06_49_37.167645_S5K.jpg
2016-12-16	06:50	No ORP signal but seeing a few animals.	15.47902	144.50679	3910	322	1481871000401S5K13657.jpg
2016-12-16	06:50	Driving along fissures to the NW. Clear-ish water.	15.47908	144.50671	3910	344	2016-12-16T06_50_36.164151_S5K.jpg
2016-12-16	06:51	Large pillows.	15.47923	144.50660	3909	338	2016-12-16T06_51_30.188639_S5K.jpg
2016-12-16	06:51	Wall of pillows on a fault scarp.	15.47928	144.50654	3910	296	2016-12-16T06_51_51.169195_S5K.jpg
2016-12-16	06:53	Need to turn to the east to get closer to the ship.	15.47950	144.50647	3911	7	2016-12-16T06_53_13.192934_S5K.jpg
2016-12-16	06:53	Few squat lobsters.	15.47953	144.50648	3912	90	2016-12-16T06_53_35.186941_S5K.jpg
2016-12-16	06:53	Heavy sediment.	15.47953	144.50649	3911	84	2016-12-16T06_53_46.189549_S5K.jpg
2016-12-16	06:54	Tiny white animals on the rocks.	15.47953	144.50653	3909	92	2016-12-16T06_54_15.186190_S5K.jpg
2016-12-16	06:54	Pillows with fractures running through the terrain. Heavy sediment.	15.47952	144.50658	3908	99	2016-12-16T06_54_47.186628_S5K.jpg
2016-12-16	06:55	Coming over the scarp.	15.47943	144.50672	3907	93	2016-12-16T06_55_53.182289_S5K.jpg
2016-12-16	06:58	Large pillow on the other side of the scarp.	15.47934	144.50700	3919	92	1481871509493S5K14166.jpg
2016-12-16	06:59	Fractured pillows.	15.47931	144.50718	3920	92	1481871571328S5K14228.jpg
2016-12-16	07:00	Long tubes and sediment.	15.47934	144.50735	3920	92	1481871635228S5K14292.jpg
2016-12-16	07:01	Back into crusty yellow sediment.	15.47942	144.50749	3916	92	2016-12-16T07_01_55.186324_S5K.jpg
2016-12-16	07:03	Heading east going up a pillow slope.	15.47938	144.50772	3914	91	2016-12-16T07_03_08.192890_S5K.jpg
2016-12-16	07:03	Climbing over sedimented pillows with little hydrothermal deposits.	15.47937	144.50778	3912	93	2016-12-16T07_03_27.208182_S5K.jpg
2016-12-16	07:03	Another old chimney	15.47938	144.50790	3910	97	1481871831559S5K14488.jpg
2016-12-16	07:03	Then you come upon piles of old hydrothermal activity.	15.47937	144.50792	3909	89	2016-12-16T07_03_56.206926_S5K.jpg
2016-12-16	07:04	Crust old hydrothermal sediments.	15.47930	144.50803	3910	86	1481871883323S5K14540.jpg
2016-12-16	07:05	Heavy sediment and lots of hydrothermal material in a flatter area.	15.47925	144.50811	3909	128	2016-12-16T07_05_10.179921_S5K.jpg
2016-12-16	07:07	Turning to the north after a transit to the east.	15.47925	144.50830	3912	4	2016-12-16T07_07_01.190565_S5K.jpg
2016-12-16	07:07	Anemones on sedimented pillows.	15.47932	144.50830	3912	4	2016-12-16T07_07_27.190999_S5K.jpg
2016-12-16	07:07	Climbing a slope.	15.47943	144.50829	3912	4	
2016-12-16	07:08	Sonar shows the slope of the feature on the Sentry map.	15.47951	144.50827	3911	5	
2016-12-16	07:08	Pillows approaching the mound in the sonar.	15.47967	144.50825	3912	6	1481872124189S5K14781.jpg
2016-12-16	07:09	Base of the slope.	15.47974	144.50824	3914	3	2016-12-16T07_09_22.202488_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	07:09	Cool pillow shapes.	15.47982	144.50823	3913	3	1481872195348S5K14852.jpg
2016-12-16	07:10	Very nubby.	15.47983	144.50821	3911	2	1481872206492S5K14863.jpg
2016-12-16	07:10	HD new file started.	15.47989	144.50820	3909	2	2016-12-16T07_10_46.187733_S5K.jpg
2016-12-16	07:11	Going to move back down to the base of this slope and then west to get a better idea of the bathy offsets.	15.47991	144.50817	3908	326	2016-12-16T07_11_15.210317_S5K.jpg
2016-12-16	07:12	A few squat lobsters.	15.47988	144.50794	3913	267	1481872338494S5K14995.jpg
2016-12-16	07:13	Active flow and squat lobsters. Diffuse flow.	15.47991	144.50777	3912	261	2016-12-16T07_13_01.186831_S5K.jpg
2016-12-16	07:13	Shrimp.	15.47992	144.50767	3912	258	2016-12-16T07_13_29.209909_S5K.jpg
2016-12-16	07:13	Lots of diffuse flow and older chimneys. Shrimp!	15.47991	144.50764	3913	270	2016-12-16T07_13_40.193654_S5K.jpg
2016-12-16	07:14	Diffuse flow in basalt! With shrimp and limpets.	15.47989	144.50762	3913	287	2016-12-16T07_14_11.200921_S5K.jpg
2016-12-16	07:14	Scale worms.	15.47995	144.50763	3913	289	2016-12-16T07_14_35.225258_S5K.jpg
2016-12-16	07:14	Crab and a lot of floc coming out of the crack.	15.47997	144.50767	3913	289	2016-12-16T07_14_44.192765_S5K.jpg
2016-12-16	07:15	Both brachyuran and galatheid crabs; very small shrimp.	15.48000	144.50764	3914	291	1481872534510S5K15191.jpg
2016-12-16	07:15	Diffuse flow and old chimneys.	15.48001	144.50764	3913	290	1481872545358S5K15202.jpg
2016-12-16	07:16	Big ORP signal now.	15.48000	144.50763	3914	318	2016-12-16T07_16_02.199746_S5K.jpg
2016-12-16	07:16	Larger patch of white staining and more animals.	15.47999	144.50762	3913	21	1481872583396S5K15240.jpg
2016-12-16	07:16	Highlights on, venting area.	15.47998	144.50765	3913	20	2016-12-16T07_16_43.233242_S5K.jpg
2016-12-16	07:16	Snails.	15.47997	144.50766	3912	22	1481872607444S5K15264.jpg
2016-12-16	07:16	Alviniconcha snails very small also. See scale worms - Branchinotogluma.	15.47996	144.50766	3912	20	
2016-12-16	07:17	Very rusty.	15.47997	144.50766	3914	21	2016-12-16T07_17_18.199271_S5K.jpg
2016-12-16	07:18	Highlights off.	15.47995	144.50764	3913	22	2016-12-16T07_18_34.208000_S5K.jpg
2016-12-16	07:20	Highlights on.	15.47995	144.50768	3913	18	2016-12-16T07_20_06.218705_S5K.jpg
2016-12-16	07:20	Chorocaris shrimp; Alviniconcha; crab is Austinograea - what are the limpets?	15.47994	144.50768	3913	18	1481872813349S5K15470.jpg
2016-12-16	07:20	Lots of water and flow with many animals.	15.47994	144.50768	3913	18	1481872813349S5K15470.jpg
2016-12-16	07:23	Going to prepare for sampling so need to move closer to the bigger flow.	15.47994	144.50764	3913	20	2016-12-16T07_23_13.178969_S5K.jpg
2016-12-16	07:23	ORP dropped by 100 but not until we were on top of it.	15.47993	144.50764	3913	18	2016-12-16T07_23_33.189183_S5K.jpg
2016-12-16	07:23	Highlights off. Re-positioning.	15.47993	144.50764	3913	15	2016-12-16T07_23_53.174196_S5K.jpg
2016-12-16	07:25	Structure is very crumbly.	15.47993	144.50764	3913	13	2016-12-16T07_25_11.174429_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	07:27	Getting some HFS temperature readings. Need to go where the sulfide worms are as that would be the hottest water.	15.47993	144.50763	3913	12	2016-12-16T07_27_44.183627_S5K.jpg
2016-12-16	07:28	Trying to find the hottest water.	15.47993	144.50763	3913	11	2016-12-16T07_28_26.190455_S5K.jpg
2016-12-16	07:29	That was up to 13°C.	15.47993	144.50763	3913	11	1481873359266S5K16016.jpg
2016-12-16	07:29	24°C....30....32....33.....35...40 and climbing.	15.47993	144.50763	3913	11	2016-12-16T07_30_08.195509_S5K.jpg
2016-12-16	07:31	Wand moved when up to 46°C.	15.47993	144.50763	3913	12	2016-12-16T07_31_19.194151_S5K.jpg
2016-12-16	07:32	This position is good if it stays put.	15.47993	144.50763	3913	12	2016-12-16T07_32_09.180831_S5K.jpg
2016-12-16	07:32	Lots of sulfide worms with the spikey tube tops in the high flow.	15.47993	144.50763	3913	12	2016-12-16T07_32_19.186992_S5K.jpg
2016-12-16	07:32	Crab attack.	15.47993	144.50763	3913	12	2016-12-16T07_32_43.178742_S5K.jpg
2016-12-16	07:33	Was 45deg there.	15.47993	144.50763	3913	12	2016-12-16T07_33_02.197011_S5K.jpg
2016-12-16	07:34	Taking a pH reading.	15.47993	144.50763	3913	12	2016-12-16T07_34_39.187963_S5K.jpg
2016-12-16	07:35	Temp=43 pH=5.11 O2=1.51 ml/l	15.47992	144.50763	3913	12	2016-12-16T07_35_57.208343_S5K.jpg
2016-12-16	07:37	Old sulphides with diffuse flows through many cracks; both oxides and sulphur deposits. Only a few hairy snails, sulfide worms; high variability.	15.47992	144.50763	3913	11	2016-12-16T07_37_17.188351_S5K.jpg
2016-12-16	07:39	S47-HFS-01 Start Unfiltered Bag #16. Believe we are close to waypoint 7 but big bathy offset and will have to determine this later.	15.47992	144.50763	3913	11	2016-12-16T07_39_10.195319_S5K.jpg
2016-12-16	07:41	Depth is 3913m and heading is almost due north.	15.47992	144.50763	3913	11	2016-12-16T07_41_23.204241_S5K.jpg
2016-12-16	07:41	Stop. Tmax=43.2 Tavg=37.9 vol=403 T2=15	15.47992	144.50763	3913	11	2016-12-16T07_41_44.193256_S5K.jpg
2016-12-16	07:43	S47-HFS-02 Start. Filtered Piston #1 Not good exhaust. Start/stop pump. Same exact location as HFS-01	15.47992	144.50763	3913	11	2016-12-16T07_43_19.183971_S5K.jpg
2016-12-16	07:44	Do not believe this one worked. No exhaust (first sample did work).	15.47992	144.50763	3913	11	
2016-12-16	07:45	Stop. Tmax=40.0 Tavg=22.8 vol=350 T2=10 Not a good sample.	15.47992	144.50763	3913	11	2016-12-16T07_45_20.210662_S5K.jpg
2016-12-16	07:45	Temperature dropped so need to reposition.	15.47992	144.50763	3913	11	2016-12-16T07_45_56.208650_S5K.jpg
2016-12-16	07:46	Moving up again.	15.47992	144.50763	3913	11	1481874382461S5K17039.jpg
2016-12-16	07:47	Good position.	15.47992	144.50763	3913	11	2016-12-16T07_47_21.190391_S5K.jpg
2016-12-16	07:50	S47-HFS-03. Start 07:50 Unfiltered Piston #2. Not seeing exhaust.	15.47992	144.50763	3913	11	2016-12-16T07_50_22.212362_S5K.jpg
2016-12-16	07:51	Does not look like a good sample again. Problem with second piston. Bag worked.	15.47992	144.50762	3913	11	2016-12-16T07_51_20.198921_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	07:52	Stop. Tmax=33.7 Tavg=31.1 vol=250 T2=11 Not good sample.	15.47992	144.50763	3913	11	2016-12-16T07_52_09.225878_S5K.jpg
2016-12-16	07:53	S47-HFS-04 Start 07:53 Filtered Bag #17 Good flow.	15.47991	144.50762	3913	11	1481874804655S5K17461.jpg
2016-12-16	07:54	Maybe some little mussels.	15.47991	144.50762	3913	11	1481874859365S5K17516.jpg
2016-12-16	07:54	Temperature went down to 16....moving the wand around and stopped the pump.	15.47991	144.50762	3913	11	1481874876588S5K17533.jpg
2016-12-16	07:55	Need to reposition.	15.47991	144.50762	3913	11	2016-12-16T07_55_17.209782_S5K.jpg
2016-12-16	07:56	Shikailepas limpets.	15.47991	144.50763	3913	11	1481875017659S5K17674.jpg
2016-12-16	07:57	Pump is back on but only at 4°C.	15.47991	144.50763	3913	11	2016-12-16T07_57_09.229429_S5K.jpg
2016-12-16	07:57	That is the flush pump is on but not the sample pump.	15.47991	144.50763	3913	11	2016-12-16T07_57_39.228873_S5K.jpg
2016-12-16	07:58	Moving arm out of the way to get a better view of the flow..	15.47991	144.50763	3913	11	2016-12-16T07_58_03.204259_S5K.jpg
2016-12-16	07:58	Highlights were on for a bit.	15.47991	144.50763	3913	11	
2016-12-16	08:00	Starting sample pump again at 25deg.	15.47991	144.50763	3913	11	1481875220406S5K17877.jpg
2016-12-16	08:01	Temp dropped again.	15.47991	144.50763	3913	10	2016-12-16T08_01_41.227915_S5K.jpg
2016-12-16	08:02	Stop 08:02. Tmax= 26.5, ave= 23.2, vol= 414, T2= 9	15.47991	144.50763	3913	10	2016-12-16T08_02_01.215636_S5K.jpg
2016-12-16	08:03	Going to try to get higher temp again.	15.47991	144.50763	3913	10	2016-12-16T08_03_06.206527_S5K.jpg
2016-12-16	08:05	About 29 at this spot.	15.47991	144.50763	3913	10	2016-12-16T08_05_42.207684_S5K.jpg
2016-12-16	08:06	36 and climbing slowly.	15.47991	144.50763	3913	10	2016-12-16T08_06_28.222025_S5K.jpg
2016-12-16	08:07	S47-HFS-05. Start 08:07. LVB #24.	15.47991	144.50763	3913	10	2016-12-16T08_07_32.221912_S5K.jpg
2016-12-16	08:11	Looking for new gastropods with the camera.	15.47991	144.50763	3913	10	1481875882692S5K18539.jpg
2016-12-16	08:11	Gastropod in crack	15.47991	144.50763	3913	10	
2016-12-16	08:11	Temp between 32- 40.	15.47991	144.50763	3913	10	2016-12-16T08_11_39.251970_S5K.jpg
2016-12-16	08:16	High temperature flow	15.47991	144.50763	3913	10	
2016-12-16	08:19	Highlights on	15.47991	144.50763	3913	10	
2016-12-16	08:19	Iris down.	15.47991	144.50763	3913	10	2016-12-16T08_19_43.241574_S5K.jpg
2016-12-16	08:21	Highlights off	15.47991	144.50763	3913	10	
2016-12-16	08:23	Shrimp	15.47991	144.50763	3913	10	2016-12-16T08_23_27.260984_S5K.jpg
2016-12-16	08:27	Scaleworm	15.47991	144.50763	3913	10	1481876832729S5K19489.jpg
2016-12-16	08:29	Merry Christmas!	15.47991	144.50763	3913	10	2016-12-16T08_29_40.246498_S5K.jpg
2016-12-16	08:30	Stop 08:30. Tmax= 40.8, ave 33.7, vol= 3400, T2= 15	15.47991	144.50763	3913	10	2016-12-16T08_30_29.226121_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	08:32	S47-HFS-06 Start 08:32 DNA Filter #10. At the same exact location as the previous sample.	15.47991	144.50763	3913	10	2016-12-16T08_32_01.230829_S5K.jpg
2016-12-16	08:33	White dots are egg cases for the limpets.	15.47991	144.50763	3913	10	2016-12-16T08_33_52.243352_S5K.jpg
2016-12-16	08:34	Limpet looks like a little mushroom.	15.47991	144.50763	3913	10	2016-12-16T08_34_33.250289_S5K.jpg
2016-12-16	08:36	Vehicle moved and temperature is dropping.	15.47990	144.50763	3913	10	2016-12-16T08_36_14.251398_S5K.jpg
2016-12-16	08:36	15deg and dropping Stopped the sample pump.	15.47990	144.50763	3913	10	2016-12-16T08_36_51.254141_S5K.jpg
2016-12-16	08:38	Trying to get wand back into position.	15.47991	144.50763	3913	10	2016-12-16T08_38_01.258817_S5K.jpg
2016-12-16	08:39	Can see wand move the rock while looking for the hot water.	15.47991	144.50763	3913	10	2016-12-16T08_39_33.253028_S5K.jpg
2016-12-16	08:40	Starting the sample pump again.	15.47991	144.50763	3913	10	2016-12-16T08_40_06.248663_S5K.jpg
2016-12-16	08:40	At a solid 40deg now.	15.47991	144.50763	3913	10	2016-12-16T08_40_32.231775_S5K.jpg
2016-12-16	08:51	Sulfide worm lace.	15.47991	144.50763	3913	10	1481878287721S5K20944.jpg
2016-12-16	08:51	Highlights on	15.47991	144.50763	3913	10	2016-12-16T08_51_36.285378_S5K.jpg
2016-12-16	08:54	Highlights off	15.47990	144.50763	3913	11	
2016-12-16	08:56	Temperature is dropping.	15.47990	144.50763	3913	11	
2016-12-16	08:56	Stop 08:56. Tmax=45.5 Tavg=37.7 vol=2723ml. T2=12	15.47990	144.50763	3913	11	2016-12-16T08_56_55.257827_S5K.jpg
2016-12-16	08:57	Done with HFS sampling at this site.	15.47990	144.50763	3913	11	2016-12-16T08_57_35.259407_S5K.jpg
2016-12-16	08:58	Stowing the wand.	15.47990	144.50763	3913	11	2016-12-16T08_58_07.263606_S5K.jpg
2016-12-16	09:02	Problems stowing the Beast wand.	15.47990	144.50763	3913	11	2016-12-16T09_02_14.278996_S5K.jpg
2016-12-16	09:04	Wand is stowed.	15.47990	144.50763	3913	11	1481879078286S5K21735.jpg
2016-12-16	09:05	Next will be some suction sampling.	15.47990	144.50763	3913	10	2016-12-16T09_04_59.277722_S5K.jpg
2016-12-16	09:06	Have the suction sampler.	15.47990	144.50763	3913	12	2016-12-16T09_06_10.284709_S5K.jpg
2016-12-16	09:06	Indexing to Jar #7.	15.47990	144.50763	3913	12	
2016-12-16	09:07	Trying to collect some snails.	15.47990	144.50763	3913	12	2016-12-16T09_07_31.266771_S5K.jpg
2016-12-16	09:08	S47-Bio-07 Suction of snails (got a few shrimp as well). At the same site as the HFS samples.	15.47990	144.50763	3913	12	1481879311504S5K21968.jpg
2016-12-16	09:10	Could see a few snails in Jar #7.	15.47990	144.50763	3913	12	2016-12-16T09_10_19.267851_S5K.jpg
2016-12-16	09:11	Ending this suction. Shaking the hose to clear it out.	15.47990	144.50763	3913	13	
2016-12-16	09:12	Indexing the jar to #8.	15.47990	144.50763	3913	13	
2016-12-16	09:12	Stowing the suction. Next will try to pick up a rock with eggs on it.	15.47990	144.50763	3913	12	2016-12-16T09_12_55.250309_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	09:14	S47-geo-08 Rock from where all the other samples were just taken. Near the snails. There were shrimp on the rock and eggs (the shrimp left). In forward-stbd quarter of the stbd biobox.	15.47990	144.50763	3913	13	2016-12-16T09_14_33.286271_S5K.jpg
2016-12-16	09:16	Done with this site. Going to move to the NW after this.	15.47990	144.50763	3913	12	2016-12-16T09_16_57.261537_S5K.jpg
2016-12-16	09:17	Going to look for the break in slope to establish the Sentry bathy offset.	15.47990	144.50763	3913	12	
2016-12-16	09:17	As we pull off bottom will look around at the other chimneys.	15.47990	144.50763	3913	12	1481879877350S5K22534.jpg
2016-12-16	09:20	Can see diffuse venting around the site.	15.47986	144.50756	3910	15	2016-12-16T09_20_44.292489_S5K.jpg
2016-12-16	09:21	That is the chimney where we were.	15.47987	144.50755	3910	45	1481880068331S5K22725.jpg
2016-12-16	09:21	Another side of the chimney just sampled.	15.47991	144.50757	3912	61	1481880097348S5K22754.jpg
2016-12-16	09:22	Very cloudy and another vent.	15.47996	144.50759	3912	66	2016-12-16T09_22_41.284798_S5K.jpg
2016-12-16	09:23	Interesting chimney.	15.48000	144.50761	3913	66	1481880181303S5K22838.jpg
2016-12-16	09:23	Looks like a castle.	15.48001	144.50762	3913	63	2016-12-16T09_23_17.279655_S5K.jpg
2016-12-16	09:23	Beautiful crown of a vent.	15.48001	144.50763	3913	63	2016-12-16T09_23_44.276397_S5K.jpg
2016-12-16	09:25	This chimney was very near the site just sampled.	15.48002	144.50765	3912	49	2016-12-16T09_25_43.284361_S5K.jpg
2016-12-16	09:26	About 2.5m across.	15.48001	144.50765	3914	42	2016-12-16T09_26_52.300554_S5K.jpg
2016-12-16	09:28	This vent will be called Palisades and the vent we sampled will be named Leaning Tower.	15.48000	144.50766	3915	17	
2016-12-16	09:30	Behind us on the slope are pillows.	15.48012	144.50768	3914	296	
2016-12-16	09:31	Facing 318 and going to continue to follow this slope.	15.48010	144.50767	3915	316	1481880690383S5K23347.jpg
2016-12-16	09:50	ROV control room lost power and went black on the screens. IRLS out until just now.	15.48033	144.50747	3916	19	
2016-12-16	09:51	Framegrabber is off.	15.48033	144.50747	3916	19	
2016-12-16	09:53	Framegrabber is back.	15.48036	144.50748	3918	18	2016-12-16T09_53_16.258753_S5K.jpg
2016-12-16	09:53	Seeing some hydrothermal deposits and pillow lavas with sediment.	15.48035	144.50748	3916	20	1481882026328S5K24683.jpg
2016-12-16	09:55	Looks like the offset is 50m to the north and 30m to the west. There is also a depth offset with the Sentry data.	15.48037	144.50748	3918	9	2016-12-16T09_55_00.269067_S5K.jpg
2016-12-16	09:55	Turning to the left to face south and zigzag to explore the area more thoroughly.	15.48035	144.50748	3915	279	
2016-12-16	09:56	Premature on the framegrabber...not working.	15.48025	144.50748	3919	184	
2016-12-16	09:57	Heading due south over sedimented pillow flow.	15.48019	144.50745	3919	190	

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	09:57	Scattered squat lobsters.	15.48014	144.50742	3918	189	
2016-12-16	09:58	Large tubes and pillows with a lot of sediment.	15.48005	144.50740	3915	188	2016-12-16T09_58_37.291834_S5K.jpg
2016-12-16	09:59	Turning a bit to the east.	15.47995	144.50735	3913	155	2016-12-16T09_59_59.274338_S5K.jpg
2016-12-16	10:00	Pillows and here is the chimney zone.	15.47995	144.50740	3913	107	
2016-12-16	10:01	Fish.	15.47992	144.50747	3913	108	2016-12-16T10_01_13.290336_S5K.jpg
2016-12-16	10:01	There is the Leaning Tower.	15.47993	144.50749	3913	96	2016-12-16T10_01_32.309663_S5K.jpg
2016-12-16	10:02	Palisades and Leaning Tower are next to each other.	15.48000	144.50758	3914	73	2016-12-16T10_02_39.314440_S5K.jpg
2016-12-16	10:03	Smoking pile of sulfide debris.	15.48011	144.50761	3915	72	1481882611782S5K25268.jpg
2016-12-16	10:03	Looking east.	15.48013	144.50763	3916	70	2016-12-16T10_03_54.325311_S5K.jpg
2016-12-16	10:04	Area looks formally very active but now all dying.	15.48014	144.50763	3914	71	1481882662604S5K25319.jpg
2016-12-16	10:04	Here is a larger chimney next to Palisades.	15.48016	144.50763	3913	70	1481882688475S5K25345.jpg
2016-12-16	10:05	Looks like another chimney behind this one at this heading.	15.48017	144.50763	3911	70	
2016-12-16	10:06	Looks like clear shimmer at the top of the first chimney.	15.48017	144.50763	3908	70	1481882782680S5K25439.jpg
2016-12-16	10:06	We are 12m off the bottom looking at the top of the chimney (a few meters above).	15.48018	144.50763	3906	71	2016-12-16T10_06_49.291103_S5K.jpg
2016-12-16	10:07	Chimneys on the side of the slope.	15.48025	144.50767	3902	130	1481882873617S5K25530.jpg
2016-12-16	10:08	Large sulfide logs that have fallen down.	15.48025	144.50768	3900	114	2016-12-16T10_08_16.307549_S5K.jpg
2016-12-16	10:09	Lots of water coming out and ORP is dropping.	15.48026	144.50769	3898	109	2016-12-16T10_09_03.293290_S5K.jpg
2016-12-16	10:09	Lots of smoke in the water and tall chimney structure but no black smoke.	15.48026	144.50771	3898	104	2016-12-16T10_09_21.313782_S5K.jpg
2016-12-16	10:11	Amazing view of old chimneys and diffuse flow within the steep basalt slope.	15.48023	144.50775	3898	41	1481883064779S5K25721.jpg
2016-12-16	10:12	Going to try to see if this goes up higher on the slope.	15.48027	144.50777	3897	36	2016-12-16T10_12_59.292210_S5K.jpg
2016-12-16	10:13	Going up the slope to the NE.	15.48028	144.50775	3895	44	2016-12-16T10_13_31.286706_S5K.jpg
2016-12-16	10:13	Highlight recording is on permanently now. No HD.	15.48028	144.50775	3895	46	2016-12-16T10_13_34.287061_S5K.jpg
2016-12-16	10:15	Amazing pillow tubes streaming down the slope with big hydrothermal chimneys sprouting from the slope.	15.48034	144.50775	3895	85	2016-12-16T10_15_03.314759_S5K.jpg
2016-12-16	10:16	Near the top of this mound and less chimneys at venting but a lot of smoke from diffuse flow.	15.48035	144.50780	3892	85	2016-12-16T10_16_32.310855_S5K.jpg
2016-12-16	10:18	Lots of shrimp up near the top.	15.48036	144.50780	3888	67	1481883527319S5K26184.jpg
2016-12-16	10:19	At the top.	15.48036	144.50777	3886	67	2016-12-16T10_19_39.302188_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	10:19	Lot of smoke coming from all around the top of this mound.	15.48036	144.50776	3885	67	2016-12-16T10_19_56.322399_S5K.jpg
2016-12-16	10:20	Moving a bit further to the east and coming down the slope.	15.48035	144.50772	3883	148	2016-12-16T10_20_49.295782_S5K.jpg
2016-12-16	10:22	More hydrothermal material further east.	15.48025	144.50770	3886	121	2016-12-16T10_22_23.346178_S5K.jpg
2016-12-16	10:23	Following some hydrothermal deposits down the hill.	15.48025	144.50778	3885	86	2016-12-16T10_23_04.313550_S5K.jpg
2016-12-16	10:24	Turning sideways but moving down the slope.	15.48032	144.50785	3887	212	
2016-12-16	10:24	Seeing the chimneys we saw going up.	15.48027	144.50783	3890	258	
2016-12-16	10:25	Zone of the tall chimneys is narrow but a lot of cloudy water around them.	15.48024	144.50783	3896	254	
2016-12-16	10:27	Slowly moving downslope looking at the line of chimneys.	15.48023	144.50778	3899	323	2016-12-16T10_27_13.335515_S5K.jpg
2016-12-16	10:28	These still have shimmering.	15.48022	144.50777	3902	324	2016-12-16T10_28_18.337966_S5K.jpg
2016-12-16	10:29	Continuing downslope.	15.48020	144.50775	3901	314	2016-12-16T10_29_25.330131_S5K.jpg
2016-12-16	10:30	Snails on the top of the chimney?	15.48017	144.50772	3904	313	2016-12-16T10_30_03.326235_S5K.jpg
2016-12-16	10:31	Calling this site "Stump of Mystery".	15.48015	144.50770	3905	313	1481884296491S5K26953.jpg
2016-12-16	10:33	Would like to sample the top of this chimney.	15.48015	144.50770	3907	312	2016-12-16T10_33_44.323362_S5K.jpg
2016-12-16	10:34	Preparing to sample.	15.48017	144.50775	3903	315	
2016-12-16	10:36	Going to wedge into the slope and the chimney.	15.48016	144.50774	3904	325	2016-12-16T10_36_08.327558_S5K.jpg
2016-12-16	10:39	Trying to land.	15.48017	144.50774	3906	309	1481884784457S5K27441.jpg
2016-12-16	10:42	Going to sample the chimney and then sample the fluid.	15.48023	144.50775	3907	312	2016-12-16T10_42_34.340915_S5K.jpg
2016-12-16	10:43	The chimney crumbled and did not make it into the biobox.	15.48019	144.50770	3907	311	1481885034663S5K27691.jpg
2016-12-16	10:44	Taking a temperature of the chimney next.	15.48020	144.50769	3907	311	2016-12-16T10_44_55.311340_S5K.jpg
2016-12-16	10:46	Highest temp that attempt was 103°C.	15.48022	144.50770	3907	311	2016-12-16T10_46_20.329495_S5K.jpg
2016-12-16	10:47	Probe is reading negative numbers. Did it exceed its limit	15.48022	144.50769	3907	311	
2016-12-16	10:48	Don't believe the ROV temp probe so will take the gastight and then get a temp with the Beast.	15.48020	144.50768	3907	312	2016-12-16T10_48_58.313010_S5K.jpg
2016-12-16	10:50	Retrieving the gastight from the basket.	15.48020	144.50771	3907	312	1481885454402S5K28111.jpg
2016-12-16	10:51	This will be Red Gastight #9.	15.48015	144.50764	3907	311	2016-12-16T10_51_36.305360_S5K.jpg
2016-12-16	10:54	More space.	15.48015	144.50768	3907	313	2016-12-16T10_54_43.308912_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	10:57	S47-GTB-09 Fired. Probe was down the hole at Stump of Mystery. Red Gastight #9. Taken from the top of the chimney in a hole that was excavated.	15.48012	144.50764	3907	313	2016-12-16T10_57_12.305104_S5K.jpg
2016-12-16	10:59	Gas tight stowed in basket.	15.48014	144.50767	3907	314	2016-12-16T10_59_05.301737_S5K.jpg
2016-12-16	11:01	Putting on the bungee.	15.48018	144.50773	3907	313	2016-12-16T11_01_27.307398_S5K.jpg
2016-12-16	11:06	Grabbing the Beast wand.	15.48018	144.50774	3907	313	2016-12-16T11_06_28.316936_S5K.jpg
2016-12-16	11:09	104 and going up.....	15.48014	144.50764	3907	313	1481886597771S5K29254.jpg
2016-12-16	11:11	Was up over 170deg....	15.48013	144.50762	3907	313	
2016-12-16	11:12	S47-HFS-10 Start 11:12. Unfiltered Piston #8. Can see exhaust. Good one.	15.48012	144.50758	3907	313	1481886735450S5K29392.jpg
2016-12-16	11:16	Stop. Tmax=221.8 Tavg=218 vol=629 T2=57.	15.48024	144.50770	3907	313	2016-12-16T11_16_33.318213_S5K.jpg
2016-12-16	11:17	S47-HFS-11 Start 11:17. Filtered Piston #7. Can see exhaust. Same exact location as HFS-10 at Stump of Mystery.	15.48020	144.50772	3907	313	1481887030569S5K29687.jpg
2016-12-16	11:18	Seeing some damage to the hose and hot fluid leaking.	15.48022	144.50774	3907	313	
2016-12-16	11:21	Stop. Tmax=224.3 Tavg=217 vol=700 T2=55.	15.48019	144.50772	3907	313	
2016-12-16	11:22	S47-HFS-12 Start 11:22. Unfiltered Piston #6 at same exact location on Stump of Mystery.	15.48017	144.50771	3907	313	1481887335371S5K29992.jpg
2016-12-16	11:26	Stop. Tmax=240.9 Tavg=233.4 vol=677 T2=58.	15.48011	144.50764	3907	313	2016-12-16T11_26_29.307354_S5K.jpg
2016-12-16	11:27	Done sampling but want to see if there is a bit higher temperature.	15.48010	144.50763	3907	313	
2016-12-16	11:28	Looks like wand even deeper into the hole...over 260°C.	15.48011	144.50763	3907	313	1481887739673S5K30396.jpg
2016-12-16	11:30	High temp now is 265.7°C.	15.48019	144.50771	3907	313	
2016-12-16	11:30	Stowing the wand and then try for another chimney sample.	15.48020	144.50773	3907	313	2016-12-16T11_30_49.302956_S5K.jpg
2016-12-16	11:32	Stowing the wand broke the chimney.	15.48023	144.50777	3907	313	2016-12-16T11_32_15.321865_S5K.jpg
2016-12-16	11:34	Going to try to grab a piece of the chimney that the HFS and gas samples came from.	15.48017	144.50772	3907	313	
2016-12-16	11:36	Going to try with a scoop.	15.48015	144.50767	3907	313	2016-12-16T11_36_35.317914_S5K.jpg
2016-12-16	11:48	Got the scoop.	15.48018	144.50778	3906	313	2016-12-16T11_48_07.343075_S5K.jpg
2016-12-16	11:49	S47-Geo-13 Sample of chimneys at the top of the chimney including the one sampled for water and gas.	15.48017	144.50782	3906	313	2016-12-16T11_49_03.331575_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	11:50	Putting the sample in the STBD biobox in the aft-port bin.	15.48016	144.50775	3906	313	
2016-12-16	11:52	Need to look for some sulfide worms on the chimney to sample.	15.48017	144.50772	3906	313	
2016-12-16	11:54	Calling the entire vent field &"Perseverance";.	15.48019	144.50771	3906	313	1481889278734S5K31935.jpg
2016-12-16	11:55	Next will try to scoop up some sulfide worms.	15.48018	144.50773	3906	313	2016-12-16T11_55_12.341027_S5K.jpg
2016-12-16	11:58	Scoop is not working so might try the suction sampler.	15.48018	144.50775	3906	313	
2016-12-16	11:59	Temp=67deg pH=4.6 O2=.87 ml/l. From the wand in the basket.	15.48018	144.50775	3906	313	
2016-12-16	12:01	Retrieving the suction hose.	15.48017	144.50774	3906	313	2016-12-16T12_01_22.345572_S5K.jpg
2016-12-16	12:02	Indexing to jar #4.	15.48016	144.50772	3906	313	
2016-12-16	12:03	Reverse flushing seawater to the sensors for HFS	15.48017	144.50771	3906	313	2016-12-16T12_03_14.359815_S5K.jpg
2016-12-16	12:04	S47-bio-14 Suction of sulfide worms from top of the chimney where the other samples came from.	15.48018	144.50772	3906	313	2016-12-16T12_04_52.368689_S5K.jpg
2016-12-16	12:05	Looks like at least two in Jar #4.	15.48018	144.50773	3906	313	2016-12-16T12_05_37.342869_S5K.jpg
2016-12-16	12:08	Discussing what to do next.	15.48018	144.50773	3906	314	2016-12-16T12_08_40.349830_S5K.jpg
2016-12-16	12:09	Going to look at the animals down below on this same chimney.	15.48019	144.50774	3907	314	2016-12-16T12_09_40.347849_S5K.jpg
2016-12-16	12:10	Re-positioning.	15.48016	144.50775	3907	308	2016-12-16T12_10_01.342070_S5K.jpg
2016-12-16	12:11	Snails on a shelf further down the chimney.	15.48015	144.50772	3909	312	2016-12-16T12_11_21.367995_S5K.jpg
2016-12-16	12:13	Ship moved us a little bit.	15.48012	144.50769	3909	314	1481890397792S5K33054.jpg
2016-12-16	12:13	Baby snails.	15.48012	144.50769	3909	319	1481890411482S5K33068.jpg
2016-12-16	12:14	Retrieving the suction hose.	15.48014	144.50771	3909	318	2016-12-16T12_14_37.349025_S5K.jpg
2016-12-16	12:15	Whoops, I mean the HFS to take sensor readings.	15.48014	144.50771	3909	318	1481890547637S5K33204.jpg
2016-12-16	12:17	First sensor reading, left of the large group of snails on grey sedimented area.	15.48014	144.50771	3909	317	2016-12-16T12_17_01.385994_S5K.jpg
2016-12-16	12:17	4.3 degrees, pH 6.64, O2 2.77.	15.48014	144.50772	3909	317	1481890668743S5K33325.jpg
2016-12-16	12:18	Into patch of snails just to the right for 2nd reading.	15.48014	144.50772	3909	317	1481890730569S5K33387.jpg
2016-12-16	12:20	Moved a bit. Was Temp 5.8, pH 6.47, O2 2.63 before moved.	15.48015	144.50772	3909	318	1481890800554S5K33457.jpg
2016-12-16	12:21	Into another patch of snails a bit higher than the last ones for reading #3.	15.48013	144.50769	3909	318	2016-12-16T12_21_03.384136_S5K.jpg
2016-12-16	12:22	Temp 12.6 degrees, pH 6.10, O2 2.17.	15.48014	144.50770	3909	318	2016-12-16T12_22_03.370865_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	12:23	S47-HFS-15. Unfiltered Bag #18. Start 12:25. In clump of snails on Stump of Mystery where sensor reading #3 taken.	15.48014	144.50770	3909	318	2016-12-16T12_23_49.381350_S5K.jpg
2016-12-16	12:27	Stop 12:27. Tmax= 16.4, ave= 15.3, vol= 403, T2= 6.5	15.48013	144.50769	3909	319	2016-12-16T12_27_31.379177_S5K.jpg
2016-12-16	12:28	Sensors back on in the same spot.	15.48010	144.50764	3909	319	2016-12-16T12_28_32.363675_S5K.jpg
2016-12-16	12:29	Temp 14.4, pH 5.89, O2 1.79. Second measurement at same spot as reading #3.	15.48006	144.50756	3909	318	1481891372716S5K34029.jpg
2016-12-16	12:31	Next location over to the right against the chimney wall where palm worm tubes ends are. Reading #4.	15.48004	144.50754	3909	320	2016-12-16T12_31_22.370311_S5K.jpg
2016-12-16	12:32	Temp slowly changing.	15.48007	144.50757	3909	320	1481891577489S5K34234.jpg
2016-12-16	12:33	Temp 9.1, pH 5.94, O2 2.35.	15.48005	144.50759	3909	320	1481891616662S5K34273.jpg
2016-12-16	12:34	Moving to the next location over to the right.	15.48008	144.50760	3909	320	1481891689601S5K34346.jpg
2016-12-16	12:35	Into sediments for reading #5.	15.48008	144.50760	3909	320	2016-12-16T12_35_39.396521_S5K.jpg
2016-12-16	12:36	Already showing 48 degrees.	15.48008	144.50760	3909	320	2016-12-16T12_36_23.367432_S5K.jpg
2016-12-16	12:38	Egg cases.	15.48009	144.50761	3909	320	2016-12-16T12_38_26.396578_S5K.jpg
2016-12-16	12:39	Shrimp has a piece of a snail.	15.48008	144.50761	3909	321	1481891939619S5K34596.jpg
2016-12-16	12:39	Reading #5. Temp 60, pH 4.67, O2 0.83.	15.48009	144.50761	3909	320	2016-12-16T12_39_48.390470_S5K.jpg
2016-12-16	12:42	S47-HFS-16. Filtered bag #19. Same location as reading #5.	15.48010	144.50765	3909	321	2016-12-16T12_42_20.406529_S5K.jpg
2016-12-16	12:44	Stop 12:44. Tmax= 73.3, ave= 69.6, vol= 400, T2= 19.	15.48014	144.50774	3909	321	2016-12-16T12_44_51.389898_S5K.jpg
2016-12-16	12:45	Moving to another sensor reading further down the chimney.	15.48012	144.50767	3909	321	2016-12-16T12_45_52.363845_S5K.jpg
2016-12-16	12:47	Reading #6 on top of thin crust by egg cases.	15.48012	144.50763	3909	321	1481892450579S5K35107.jpg
2016-12-16	12:49	Temp still dropping.	15.48013	144.50759	3909	321	1481892539584S5K35196.jpg
2016-12-16	12:49	Temp 2.7 degrees, pH 6.85, O2 1.95. Reading #6.	15.48015	144.50757	3909	321	2016-12-16T12_49_46.416363_S5K.jpg
2016-12-16	12:50	Going to stow HFS wand and get ready to suction.	15.48015	144.50758	3909	323	2016-12-16T12_50_37.392171_S5K.jpg
2016-12-16	12:53	Getting suction sampler out.	15.48013	144.50769	3909	322	1481892823426S5K35480.jpg
2016-12-16	12:55	Going to suction snails where we took reading #3 and S47-HFS-15.	15.48013	144.50773	3909	323	2016-12-16T12_55_26.389162_S5K.jpg
2016-12-16	12:56	S47-Bio-17. Suctioning snails into Jar #6 at Stump of Mystery. Same location as sensor reading #3 and S47-HFS-15.	15.48012	144.50773	3909	323	2016-12-16T12_56_00.382107_S5K.jpg
2016-12-16	12:57	Shrimp too.	15.48009	144.50771	3909	324	2016-12-16T12_57_40.377561_S5K.jpg

Date	Time	S47 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	12:58	S47-Bio-18. Now going to suction palm worms.	15.48007	144.50769	3909	323	1481893096884S5K35753.jpg
2016-12-16	12:58	Suctioning sulfide worms at the same location as reading #4. Into Jar #5.	15.48007	144.50769	3909	323	2016-12-16T12_58_31.406495_S5K.jpg
2016-12-16	13:00	Bits are going into the jar.	15.48017	144.50764	3909	324	1481893241852S5K35898.jpg
2016-12-16	13:01	Nice clump of them in the jar.	15.48014	144.50758	3909	325	2016-12-16T13_01_27.419847_S5K.jpg
2016-12-16	13:02	Lots of shrimp too.	15.48012	144.50752	3909	323	2016-12-16T13_02_01.419204_S5K.jpg
2016-12-16	13:02	Got a big one!	15.48010	144.50747	3909	323	1481893351833S5K36008.jpg
2016-12-16	13:02	Some snails too.	15.48008	144.50742	3909	323	2016-12-16T13_02_51.397629_S5K.jpg
2016-12-16	13:03	Can't tell if the big one is in the jar.	15.48006	144.50738	3909	323	1481893390419S5K36047.jpg
2016-12-16	13:03	Putting the suction hose away.	15.48004	144.50733	3909	323	1481893409629S5K36066.jpg
2016-12-16	13:04	Going to grab a rock with animals on it.	15.48023	144.50777	3909	323	1481893441569S5K36098.jpg
2016-12-16	13:04	Will need to leave bottom soon as coms oil getting low.	15.48023	144.50777	3909	323	1481893459719S5K36116.jpg
2016-12-16	13:05	Reaching for the orange chimney. Hard.	15.48019	144.50772	3909	323	2016-12-16T13_05_26.430723_S5K.jpg
2016-12-16	13:06	S47-Geo-19 Orange piece of Stump of Mystery. Hoping there is some animals on it. Into rear port bio box, rear stbd partition.	15.48019	144.50772	3909	324	2016-12-16T13_06_12.409190_S5K.jpg
2016-12-16	13:07	Reaching for the puck.	15.48020	144.50771	3909	325	1481893659787S5K36316.jpg
2016-12-16	13:08	Re-grabbing puck with better grasp.	15.48018	144.50772	3909	325	1481893700644S5K36357.jpg
2016-12-16	13:09	Will be deployed on the way up.	15.48017	144.50773	3909	326	2016-12-16T13_09_43.408777_S5K.jpg
2016-12-16	13:10	Closing it all the way.	15.48018	144.50772	3909	326	1481893799599S5K36456.jpg
2016-12-16	13:10	S47-Bio-20 Control, SPME #1. Holding it in manipulator arm for 10 minutes on our way to the surface.	15.48017	144.50773	3909	326	2016-12-16T13_10_19.415640_S5K.jpg
2016-12-16	13:11	Putting scoop away and securing HFS at the same time.	15.48006	144.50735	3903	328	1481893908829S5K36565.jpg
2016-12-16	13:19	Getting ready to release puck.	15.47949	144.50695	3642	267	
2016-12-16	13:20	Released into rear port biobox, forward stbd partition.	15.47950	144.50693	3608	269	
2016-12-16	13:28	ROV off bottom about 13:20. Coming up.	15.47948	144.50677	3405	270	

Table 6.6-13 Dive S48 – Perseverance

Date	Time	S48 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	22:02	Bottom in site.	15.47956	144.50775	3907	98	2016-12-16T22_02_43.048070_S5K.jpg
2016-12-16	22:02	Sedimented pillow lavas.	15.47956	144.50775	3911	100	2016-12-16T22_02_58.028360_S5K.jpg
2016-12-16	22:03	Some squat lobsters and HD is on.	15.47957	144.50775	3909	100	S5K10422.jpg

Date	Time	S48 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	22:04	Can see the bathymetry bump in the sonar ahead looking east.	15.47958	144.50781	3910	99	2016-12-16T22_04_30.035369_S5K.jpg
2016-12-16	22:05	Heavy sediment and pillows in a flatter area.	15.47958	144.50788	3910	99	S5K10510.jpg
2016-12-16	22:06	Going to drive east a bit.	15.47961	144.50795	3911	98	2016-12-16T22_06_20.045180_S5K.jpg
2016-12-16	22:06	Coming up to a mound of sulfides.	15.47962	144.50798	3910	95	S5K10597.jpg
2016-12-16	22:06	Old mound with only a few squat lobsters.	15.47962	144.50803	3910	94	2016-12-16T22_06_52.051589_S5K.jpg
2016-12-16	22:07	Pile of sulfide rubble surrounded by pillow lavas.	15.47961	144.50803	3911	48	2016-12-16T22_07_19.046542_S5K.jpg
2016-12-16	22:07	Looking north is all pillows.	15.47961	144.50804	3911	14	S5K10668.jpg
2016-12-16	22:08	East look is downhill beyond the sulfide mound.	15.47962	144.50802	3910	106	2016-12-16T22_08_23.038278_S5K.jpg
2016-12-16	22:08	South is all pillows.	15.47963	144.50804	3909	181	S5K10736.jpg
2016-12-16	22:09	After the look around going to head about 20m to the east.	15.47961	144.50801	3909	100	2016-12-16T22_09_28.039278_S5K.jpg
2016-12-16	22:10	Heading downslope.	15.47962	144.50814	3907	82	2016-12-16T22_10_44.039052_S5K.jpg
2016-12-16	22:11	Moved into pillow lavas.	15.47964	144.50822	3910	82	2016-12-16T22_11_25.048747_S5K.jpg
2016-12-16	22:11	Next turning north to follow the base of the pillow mound.	15.47964	144.50826	3911	73	2016-12-16T22_11_44.035338_S5K.jpg
2016-12-16	22:12	Heavy sediment and pillows.	15.47971	144.50825	3911	359	2016-12-16T22_12_42.068595_S5K.jpg
2016-12-16	22:13	At the edge of the mound. Turning left to follow the edge.	15.47974	144.50823	3912	358	S5K10982.jpg
2016-12-16	22:13	Port view has old sulfide mound and right has pillows.	15.47975	144.50819	3911	300	S5K11019.jpg
2016-12-16	22:14	ORP has continued to drop.	15.47973	144.50810	3910	268	2016-12-16T22_14_21.072784_S5K.jpg
2016-12-16	22:15	Moving back closer to the slope to the north. Came off into the flat pillows a bit.	15.47976	144.50800	3910	266	2016-12-16T22_15_22.067851_S5K.jpg
2016-12-16	22:15	A bunch of animals and now a chimney in the distance.	15.47988	144.50793	3910	269	2016-12-16T22_15_53.062364_S5K.jpg
2016-12-16	22:16	Heading for the chimney.	15.47991	144.50791	3911	274	2016-12-16T22_16_12.052961_S5K.jpg
2016-12-16	22:16	Same area as sampled on the first dive. Stump of Mystery and Palisades.	15.47996	144.50786	3912	273	S5K11212.jpg
2016-12-16	22:18	That was Leaning Tower and Palisades (not Stump of Mystery...correct that).	15.47996	144.50781	3911	246	2016-12-16T22_18_26.053972_S5K.jpg
2016-12-16	22:18	That was a group of framegrabs as the ROV did a 360 at the site.	15.47993	144.50779	3911	281	2016-12-16T22_18_55.081569_S5K.jpg
2016-12-16	22:19	Diffuse venting.	15.47991	144.50777	3911	6	S5K11366.jpg
2016-12-16	22:19	Going to head up the slope to the NE.	15.47990	144.50777	3909	37	S5K11377.jpg

Date	Time	S48 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	22:20	About a 20m offset from the last dive's navigation target at Palisades.	15.47993	144.50781	3912	65	2016-12-16T22_20_14.058944_S5K.jpg
2016-12-16	22:20	Fish.	15.47996	144.50787	3913	64	2016-12-16T22_20_43.057811_S5K.jpg
2016-12-16	22:20	Pillow buds look like a great place to sample.	15.47996	144.50788	3912	64	2016-12-16T22_20_54.073550_S5K.jpg
2016-12-16	22:24	A lonely shrimp.	15.47995	144.50791	3912	56	2016-12-16T22_24_16.070098_S5K.jpg
2016-12-16	22:24	Sampling pillows with the STBD arm.	15.47993	144.50789	3912	53	2016-12-16T22_24_42.065627_S5K.jpg
2016-12-16	22:26	Too fat?	15.47990	144.50786	3912	57	2016-12-16T22_26_02.078188_S5K.jpg
2016-12-16	22:27	Decided to try the port arm instead.	15.47994	144.50790	3911	32	S5K11877.jpg
2016-12-16	22:30	Rocks look a bit fuzzy.	15.47996	144.50793	3909	38	S5K12019.jpg
2016-12-16	22:32	H264 recording now.	15.47995	144.50793	3909	32	S5K12145.jpg
2016-12-16	22:32	Rocks are fragile.	15.47996	144.50792	3909	24	2016-12-16T22_32_43.083960_S5K.jpg
2016-12-16	22:35	Might be too difficult to sample here.	15.48000	144.50788	3909	47	2016-12-16T22_35_27.084165_S5K.jpg
2016-12-16	22:37	Moving ship north and closer to ROV.	15.48002	144.50790	3909	34	
2016-12-16	22:38	S48-geo-01 Bud of pillow lava near the bottom of the slope of the pillow mound after turning north from Palisades. Sampling was difficult due to the crumbly nature of these pillows.	15.48000	144.50789	3909	28	
2016-12-16	22:41	Placing sample in the forward milk crate.	15.48002	144.50793	3907	38	2016-12-16T22_41_17.094213_S5K.jpg
2016-12-16	22:41	In the aft-port quarter of the crate. Bin #4.	15.48004	144.50794	3907	38	2016-12-16T22_41_43.088502_S5K.jpg
2016-12-16	22:42	A few squat lobsters in the area of the sample as well.	15.48008	144.50795	3908	38	2016-12-16T22_42_20.088980_S5K.jpg
2016-12-16	22:43	Facing upslope of this pillow mound.	15.48014	144.50794	3904	36	2016-12-16T22_43_17.087325_S5K.jpg
2016-12-16	22:45	Moving upslope.	15.48015	144.50796	3896	53	2016-12-16T22_45_19.074801_S5K.jpg
2016-12-16	22:46	Weather is borderline and building with a definite pull by 3pm.	15.48010	144.50794	3891	61	2016-12-16T22_46_15.095815_S5K.jpg
2016-12-16	22:47	Shattered pillow.	15.48012	144.50800	3887	53	2016-12-16T22_47_06.085343_S5K.jpg
2016-12-16	22:47	Scattered squat lobsters going NE up the pillow mound.	15.48013	144.50802	3885	57	S5K13042.jpg
2016-12-16	22:48	Drop-off to the east which corresponds with the Sentry bathy.	15.48014	144.50809	3881	57	2016-12-16T22_48_23.097414_S5K.jpg
2016-12-16	22:49	Steeper slope with less sediment.	15.48013	144.50810	3880	63	2016-12-16T22_49_32.101621_S5K.jpg
2016-12-16	22:50	Flattening out and less sediment.	15.48020	144.50816	3879	64	2016-12-16T22_50_17.108150_S5K.jpg
2016-12-16	22:50	A lot of particulates in the water. ORP is dropping more.	15.48027	144.50827	3877	70	2016-12-16T22_50_45.105835_S5K.jpg
2016-12-16	22:51	Scanning around for smoke.	15.48039	144.50834	3878	67	2016-12-16T22_51_13.100260_S5K.jpg

Date	Time	S48 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-16	22:52	Lots of particulates still and ORP still dropping.	15.48036	144.50820	3876	57	2016-12-16T22_52_34.120511_S5K.jpg
2016-12-16	22:53	More hydrothermal sediment.	15.48028	144.50832	3877	40	2016-12-16T22_53_54.100069_S5K.jpg
2016-12-16	22:55	Scanned around and couldn't see any targets on the sonar but still a lot of particulates in the water.	15.48035	144.50830	3877	70	2016-12-16T22_55_17.108155_S5K.jpg
2016-12-16	22:56	ORP plunged quit a lot and temperature rose as well but can't see anything specific.	15.48034	144.50834	3875	355	2016-12-16T22_56_06.088903_S5K.jpg
2016-12-16	22:57	Very smokey and still dropping ORP.	15.48036	144.50835	3877	81	S5K13622.jpg
2016-12-16	22:57	Floc is coming from the right. Heading that way.	15.48034	144.50836	3877	73	2016-12-16T22_57_17.094807_S5K.jpg
2016-12-16	22:58	All sensors are showing temperature rise.	15.48020	144.50842	3884	167	S5K13695.jpg
2016-12-16	22:59	Here are some sulfides but not shimmer.	15.48028	144.50850	3881	70	S5K13743.jpg
2016-12-16	22:59	Need to park the ROV to do some work with the communications of ROV. Need to recycle.	15.48035	144.50852	3881	56	2016-12-16T22_59_33.120359_S5K.jpg
2016-12-16	23:00	A few shrimp and hydrothermal sediment.	15.48034	144.50852	3882	73	2016-12-16T23_00_20.122453_S5K.jpg
2016-12-16	23:01	HD new file started.	15.48038	144.50854	3874	43	S5K13915.jpg
2016-12-16	23:02	Moving upslope.	15.48040	144.50856	3874	42	2016-12-16T23_02_05.114708_S5K.jpg
2016-12-16	23:02	More sediment and ORP still dropping.	15.48047	144.50858	3876	35	S5K13958.jpg
2016-12-16	23:02	Cloudy water and more sulfides.	15.48052	144.50862	3875	50	S5K13975.jpg
2016-12-16	23:03	Sulfides.	15.48056	144.50869	3876	54	2016-12-16T23_03_15.127381_S5K.jpg
2016-12-16	23:03	Navigational marker put where highest ROV temperature was.	15.48059	144.50877	3875	49	
2016-12-16	23:05	Having fiber issues with the ROV.	15.48064	144.50869	3878	47	S5K14135.jpg
2016-12-16	23:06	Do not see shimmer.	15.48066	144.50874	3882	61	2016-12-16T23_06_21.112264_S5K.jpg
2016-12-16	23:06	ORP signal was lost somewhere with the fiber issue. A few shrimp.	15.48065	144.50875	3882	61	2016-12-16T23_06_51.108885_S5K.jpg
2016-12-16	23:07	Coming off the bottom due to telemetry issues in the fiber.	15.48064	144.50870	3877	12	2016-12-16T23_07_12.076303_S5K.jpg

Table 6.6-14 Dive S49 – Perseverance

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
		Dive was initially aborted before reaching the bottom and 3 HFS background water samples were taken while ascending. Winds died down and the dive was given the green light to descend again.					
2016-12-18	02:31	Bottom in sight.	15.48020	144.50727	3907	35	
2016-12-18	02:31	Pillow lavas with scattered squat lobsters.	15.48019	144.50727	3911	38	2016-12-18T02_31_46.579538_S5K.jpg
2016-12-18	02:32	Vent to the right.	15.48021	144.50732	3912	42	2016-12-18T02_32_20.579500_S5K.jpg

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-18	02:32	That was the Palisades site.	15.48024	144.50736	3912	51	1482028357848S5K18229.jpg
2016-12-18	02:32	There is the Stump of Mystery ahead on the slope.	15.48029	144.50740	3912	50	2016-12-18T02_32_54.580468_S5K.jpg
2016-12-18	02:33	Log pile on the bottom.	15.48036	144.50748	3913	47	2016-12-18T02_33_25.576839_S5K.jpg
2016-12-18	02:34	This was not the one we sampled and haven't looked at this one really. Stump is further up on the slope.	15.48038	144.50750	3910	56	2016-12-18T02_34_00.581342_S5K.jpg
2016-12-18	02:35	Smoke in the water.	15.48046	144.50757	3903	138	1482028543607S5K18415.jpg
2016-12-18	02:36	Swarming with shrimp	15.48044	144.50756	3905	142	2016-12-18T02_36_02.571888_S5K.jpg
2016-12-18	02:36	Here it is.	15.48042	144.50756	3906	142	1482028577782S5K18449.jpg
2016-12-18	02:36	Stump of Mystery!	15.48041	144.50755	3907	141	2016-12-18T02_36_29.553097_S5K.jpg
2016-12-18	02:37	Last gastight was taken at 312deg of heading.	15.48034	144.50760	3906	340	2016-12-18T02_37_49.560888_S5K.jpg
2016-12-18	02:38	Highlights on and off, approaching Stump of Mystery. 02:37- 02:38.	15.48035	144.50762	3906	308	2016-12-18T02_38_29.573504_S5K.jpg
2016-12-18	02:39	Looking for a place to park the ROV for sampling.	15.48032	144.50766	3904	301	2016-12-18T02_39_14.575694_S5K.jpg
2016-12-18	02:41	Big ORP drop while over this vent on the MAPR.	15.48010	144.50776	3906	327	2016-12-18T02_41_53.566280_S5K.jpg
2016-12-18	02:43	Having difficulties finding a place to approach the vent.	15.48012	144.50773	3906	330	2016-12-18T02_43_44.576871_S5K.jpg
2016-12-18	02:47	Preparing for gastight sample. It is Green #2.	15.48020	144.50768	3907	330	2016-12-18T02_47_19.572580_S5K.jpg
2016-12-18	02:49	Grabbed it.	15.48023	144.50766	3907	330	2016-12-18T02_49_29.558953_S5K.jpg
2016-12-18	02:51	Holding gastight over the chimney.	15.48024	144.50770	3907	330	2016-12-18T02_51_38.547032_S5K.jpg
2016-12-18	02:52	Alignment is good with the ram.	15.48022	144.50772	3907	330	2016-12-18T02_52_51.552836_S5K.jpg
2016-12-18	02:55	Attempting to sample from this orifice.	15.48020	144.50771	3907	330	2016-12-18T02_55_11.572632_S5K.jpg
2016-12-18	02:57	Couldn't get to that one.	15.48018	144.50773	3907	329	1482029835899S5K19707.jpg
2016-12-18	03:00	Need to reposition the ROV.	15.48017	144.50772	3907	329	2016-12-18T03_00_00.582412_S5K.jpg
2016-12-18	03:00	Trying to move up a bit.	15.48017	144.50767	3907	329	2016-12-18T03_00_36.566819_S5K.jpg
2016-12-18	03:01	Landed on top at 307 heading.	15.48019	144.50771	3907	317	2016-12-18T03_01_36.589978_S5K.jpg
2016-12-18	03:04	Trying here again.	15.48017	144.50766	3906	317	2016-12-18T03_04_18.584525_S5K.jpg
2016-12-18	03:05	Came off the chimney when rotated to align the ram.	15.48019	144.50768	3906	317	2016-12-18T03_05_57.575907_S5K.jpg
2016-12-18	03:06	Chimney broke.	15.48014	144.50772	3904	316	1482030381051S5K20252.jpg
2016-12-18	03:07	Ram got bent.	15.48011	144.50776	3908	320	2016-12-18T03_07_25.559312_S5K.jpg

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-18	03:08	S49-GTB-04 Fired. This was fired before the view of the bent ram. Saw the tip go into the chimney (not further into the hold) when fired. Questions raised if it actually fired so not logged at the time as a sample.	15.48010	144.50776	3907	317	2016-12-18T03_08_46.571937_S5K.jpg
2016-12-18	03:12	Stowing the GTB bottle.	15.48004	144.50777	3910	320	
2016-12-18	03:14	Heading down to Leaning Tower area.	15.47999	144.50778	3905	59	
2016-12-18	03:15	Downslope.	15.47988	144.50778	3907	28	2016-12-18T03_15_14.567984_S5K.jpg
2016-12-18	03:15	There is Palisades.	15.47979	144.50776	3911	291	1482030954694S5K20826.jpg
2016-12-18	03:16	And here is the Leaning Tower.	15.47975	144.50775	3910	286	
2016-12-18	03:16	Looking for diffuse water coming out of the basalt.	15.47972	144.50772	3911	245	2016-12-18T03_16_33.587015_S5K.jpg
2016-12-18	03:17	There is some smoking pillows.	15.47977	144.50762	3910	202	1482031043081S5K20914.jpg
2016-12-18	03:19	Looking at the shimmer where the crack and shrimp are.	15.47991	144.50752	3914	150	2016-12-18T03_19_11.578140_S5K.jpg
2016-12-18	03:19	Retrieving the HFS wand.	15.47996	144.50750	3914	147	2016-12-18T03_19_57.613832_S5K.jpg
2016-12-18	03:20	ORP flattened out after coming off the Stump.	15.47995	144.50748	3914	148	
2016-12-18	03:21	Beast communication has turned off.	15.47999	144.50756	3914	147	1482031293675S5K21165.jpg
2016-12-18	03:25	Rebooting HFS software.	15.48007	144.50742	3914	144	
2016-12-18	03:28	Crusty surface.	15.47990	144.50752	3914	144	2016-12-18T03_28_16.593192_S5K.jpg
2016-12-18	03:29	Shrimp just shook a whole lot of particles off its body?	15.47984	144.50754	3914	143	2016-12-18T03_29_28.599098_S5K.jpg
2016-12-18	03:30	HD new file started.	15.47988	144.50758	3914	142	2016-12-18T03_30_28.600461_S5K.jpg
2016-12-18	03:31	Shrimp carapace in the water.	15.47992	144.50756	3914	141	2016-12-18T03_31_11.609935_S5K.jpg
2016-12-18	03:31	Can see HFS communicating down but not receiving any data coming back.	15.47992	144.50755	3914	140	2016-12-18T03_31_15.613429_S5K.jpg
2016-12-18	03:31	Stowing the wand while troubleshooting the Beast.	15.47993	144.50758	3914	141	
2016-12-18	03:37	Moving forward to the bright-white patch.	15.47992	144.50774	3914	142	2016-12-18T03_37_49.602793_S5K.jpg
2016-12-18	03:40	Want to suction along the white crack into Jar #2.	15.48007	144.50775	3914	140	2016-12-18T03_40_02.605796_S5K.jpg
2016-12-18	03:42	Indexing to jar #2.	15.47995	144.50746	3914	137	2016-12-18T03_42_20.605800_S5K.jpg
2016-12-18	03:42	S49-Bio-05 Suctioning into Jar #2 from the cracks in the seafloor near the base of Leaning Tower. White cracks with floc coming out but aiming for sediment.	15.47991	144.50745	3914	137	2016-12-18T03_42_34.643035_S5K.jpg
2016-12-18	03:44	Got the small limpet.	15.47989	144.50748	3914	139	2016-12-18T03_44_49.629163_S5K.jpg
2016-12-18	03:45	Taking the scaleworm.	15.47990	144.50751	3914	139	1482032708776S5K22580.jpg

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-18	03:47	Moving over to the left. Rebooting the HFS laptop and reconnecting.	15.47989	144.50760	3914	141	2016-12-18T03_47_02.622913_S5K.jpg
2016-12-18	03:48	Finished Jar #2.	15.47987	144.50762	3914	139	
2016-12-18	03:48	Moving to Jar #3 (500 microns).	15.47986	144.50762	3914	139	
2016-12-18	03:49	S49-Bio-06 Suction along the surface of the orange rock next to the white crack sampled on bio-05.	15.47986	144.50763	3914	139	2016-12-18T03_49_00.614695_S5K.jpg
2016-12-18	03:50	Reaching for the surface on the other side of the crack.	15.47983	144.50767	3914	142	2016-12-18T03_50_30.599473_S5K.jpg
2016-12-18	03:51	Suctioning into jar #3.	15.47993	144.50758	3914	140	2016-12-18T03_51_16.615000_S5K.jpg
2016-12-18	03:51	Can see some black scrapes from where suctioned.	15.48001	144.50755	3914	142	2016-12-18T03_51_56.623855_S5K.jpg
2016-12-18	03:52	Done with Jar #3.	15.48004	144.50751	3914	141	
2016-12-18	03:52	Field shrimp feasting on the bottom.	15.48006	144.50750	3914	139	1482033172696S5K23044.jpg
2016-12-18	03:53	Want to sample the substrate sticking up just forward of the ROV (triangular).	15.48006	144.50753	3914	139	2016-12-18T03_53_50.628402_S5K.jpg
2016-12-18	03:55	Lots of floc that come up when bumped.	15.47996	144.50761	3913	136	2016-12-18T03_55_07.610271_S5K.jpg
2016-12-18	03:56	Snow storm.	15.47994	144.50762	3914	136	2016-12-18T03_55_59.640985_S5K.jpg
2016-12-18	04:01	Want a piece of the rock down lower.	15.47987	144.50760	3914	122	2016-12-18T04_01_02.615662_S5K.jpg
2016-12-18	04:01	Won't break off.	15.47997	144.50765	3914	126	2016-12-18T04_01_45.596696_S5K.jpg
2016-12-18	04:02	That piece is too soft.	15.48000	144.50760	3914	131	1482033752083S5K23623.jpg
2016-12-18	04:03	That location didn't work so now will try to sample a sulfide.	15.48005	144.50766	3914	129	2016-12-18T04_03_15.622139_S5K.jpg
2016-12-18	04:04	HFS is back so want to move the vehicle back to the crack with the shrimp and shimmer.	15.47995	144.50766	3914	122	1482033858012S5K23729.jpg
2016-12-18	04:05	Moving the vehicle back.	15.47979	144.50761	3912	40	2016-12-18T04_05_16.593789_S5K.jpg
2016-12-18	04:06	Looking for the spot.	15.47982	144.50757	3911	69	1482033975636S5K23847.jpg
2016-12-18	04:07	This site looks good for a diffuse HFS sample.	15.47981	144.50758	3912	67	1482034026939S5K23898.jpg
2016-12-18	04:08	Getting the wand.	15.47982	144.50757	3912	67	1482034084750S5K23956.jpg
2016-12-18	04:09	Thin little crust broke when the hose touched it. No temperature anomaly here.	15.47984	144.50757	3912	67	2016-12-18T04_09_00.587941_S5K.jpg
2016-12-18	04:09	Going to move up forward to a better site.	15.47986	144.50757	3912	67	
2016-12-18	04:11	Looks like the same place where the suction samples were taken. Background is 1.8°C.	15.47985	144.50758	3913	54	2016-12-18T04_11_31.616193_S5K.jpg
2016-12-18	04:12	2.4°C here....	15.47990	144.50759	3913	54	2016-12-18T04_12_19.629641_S5K.jpg
2016-12-18	04:13	3.3deg and going up just a little.	15.47989	144.50760	3913	54	1482034379740S5K24251.jpg

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-18	04:13	7deg and rising a bit.	15.47992	144.50761	3913	54	2016-12-18T04_13_28.625225_S5K.jpg
2016-12-18	04:14	6...and going down.	15.47993	144.50763	3913	54	2016-12-18T04_14_11.597890_S5K.jpg
2016-12-18	04:14	8.8deg and fairly steady.	15.47992	144.50765	3913	54	2016-12-18T04_14_51.600977_S5K.jpg
2016-12-18	04:15	Wand came out while turning on sensors.	15.47991	144.50763	3913	58	
2016-12-18	04:15	Coming up and moving over a little bit to the left.	15.47984	144.50763	3912	58	2016-12-18T04_15_47.599931_S5K.jpg
2016-12-18	04:17	Good spot...12 and going up.	15.47979	144.50760	3913	42	2016-12-18T04_16_59.606852_S5K.jpg
2016-12-18	04:17	Sensors are on.	15.47980	144.50757	3913	41	2016-12-18T04_17_38.611019_S5K.jpg
2016-12-18	04:18	Temp=18 pH=5.55 O2=1.11 ml/l Calibration is needed.	15.47983	144.50756	3913	41	
2016-12-18	04:19	S49-HFS-07 Start 04:19 Unfiltered Bag #18 Taken from diffuse flow with limpets and shrimp near the base of Leaning Tower in crack with shimmer.	15.47982	144.50754	3913	41	2016-12-18T04_19_37.628871_S5K.jpg
2016-12-18	04:21	Limpet's Canyon site is near the base of Leaning Tower.	15.47982	144.50750	3913	41	2016-12-18T04_21_09.617846_S5K.jpg
2016-12-18	04:22	Stop 04:22 Tmax=20.8 Tavg=19.0 vol=400 T2=8.8	15.47983	144.50753	3913	41	
2016-12-18	04:22	S49-HFS-08 Start 04:22 Filtered Bag #18 At the same location as last sample at Limpet's Canyon.	15.47981	144.50757	3913	41	1482034963911S5K24835.jpg
2016-12-18	04:25	Stop 04:25 Tmax=21.0 Tavg=19.0 vol=400 T2=9	15.47994	144.50766	3913	41	
2016-12-18	04:25	Next the long sample.	15.47994	144.50767	3913	41	
2016-12-18	04:26	S49-HFS-09 Start 04:26 LVB #24 At same location.	15.47997	144.50770	3913	41	
2016-12-18	04:28	No flow right now.	15.47984	144.50768	3913	41	2016-12-18T04_28_30.616671_S5K.jpg
2016-12-18	04:29	Stop. No flow so aborting.	15.47991	144.50773	3913	41	2016-12-18T04_29_26.638332_S5K.jpg
2016-12-18	04:30	S49-HFS-10. RNA filter #10. Same location as previous sample. Seeing flow this time.	15.47985	144.50772	3913	41	1482035437819S5K25309.jpg
2016-12-18	04:41	Limpets in crack.	15.47993	144.50759	3913	42	1482036074017S5K25945.jpg
2016-12-18	04:44	Animals seen here are limpets, sulfide worms, scaleworms, shrimp, shrimp and crabs.	15.47974	144.50763	3913	42	1482036288661S5K26160.jpg
2016-12-18	04:45	Egg cases.	15.47977	144.50763	3913	42	1482036357882S5K26229.jpg
2016-12-18	04:46	Must leave the bottom by 4pm so there is just 1 hour and 10 minutes left.	15.47979	144.50766	3913	42	2016-12-18T04_46_44.617308_S5K.jpg
2016-12-18	04:49	HD new file started.	15.47992	144.50791	3913	42	2016-12-18T04_49_50.634556_S5K.jpg
2016-12-18	04:56	Stop 04:56 Tmax=21 Tavg=17.7 T2=8 vol=2997 ml.	15.48008	144.50744	3913	43	1482036959721S5K26831.jpg
2016-12-18	04:57	S49-HFS-11 Start Unfiltered Bag #20 At the same location at Limpet Canyon after the RNA filter.	15.47991	144.50769	3913	44	2016-12-18T04_57_44.644985_S5K.jpg
2016-12-18	04:58	A little hotter after the bump.	15.47992	144.50777	3912	44	1482037131127S5K27002.jpg

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-18	05:00	Stop 05:00 Tmax=19.3 Tavg=18.3 T2=8.7 vol=420 ml.	15.47968	144.50784	3912	44	2016-12-18T05_00_24.638424_S5K.jpg
2016-12-18	05:01	Stowing the wand and done with this site. Going back to Stump of Mystery.	15.47980	144.50775	3912	44	1482037260113S5K27131.jpg
2016-12-18	05:01	Will hold wand until next site.	15.47975	144.50770	3912	49	1482037281661S5K27153.jpg
2016-12-18	05:02	Heading back up the slope after doing a 270deg turn.	15.47978	144.50771	3911	37	2016-12-18T05_02_02.630178_S5K.jpg
2016-12-18	05:04	Coming back down to the bottom after the spin.	15.48013	144.50763	3916	32	2016-12-18T05_04_54.643899_S5K.jpg
2016-12-18	05:06	Coming up to the site.	15.48022	144.50769	3902	70	2016-12-18T05_06_26.638926_S5K.jpg
2016-12-18	05:07	Other chimneys higher up the slope. Need to come back down to 3907.	15.48025	144.50773	3896	95	2016-12-18T05_07_26.636237_S5K.jpg
2016-12-18	05:08	Stump of Mystery again.	15.48014	144.50772	3903	29	1482037706781S5K27578.jpg
2016-12-18	05:09	ORP dropped like a rock when came over the chimney.	15.48016	144.50775	3905	343	1482037798816S5K27670.jpg
2016-12-18	05:12	Preparing to sample without a lot of visibility in the shimmer.	15.48016	144.50774	3906	346	1482037936059S5K27807.jpg
2016-12-18	05:13	Reverse flush and saw a puff of sediment out of wand tip.	15.48016	144.50775	3906	346	1482038028862S5K27900.jpg
2016-12-18	05:14	Only 19deg.	15.48015	144.50774	3906	346	2016-12-18T05_14_44.636698_S5K.jpg
2016-12-18	05:18	S49-HFS-12 Start 05:18 Filtered Piston #3 Taken at the top of Stump of Mystery but not in the hottest water. Not working Aborted.	15.48016	144.50773	3906	346	
2016-12-18	05:19	S49-HFS-13 Start 05:19. Unfiltered Piston #4. Can see exhaust. Good example at the top but not hottest water at Stump.	15.48016	144.50773	3906	346	2016-12-18T05_19_49.648406_S5K.jpg
2016-12-18	05:22	Stop 05:22 Tmax=44.7 Tavg=38.3 vol=500 T2=15.	15.48015	144.50772	3906	346	
2016-12-18	05:24	Stow the wand.	15.48015	144.50771	3906	346	
2016-12-18	05:27	Driving along the ridge slope to be below the target ORP place.	15.47997	144.50772	3896	94	2016-12-18T05_27_31.637029_S5K.jpg
2016-12-18	05:28	Driving along the slope.	15.48003	144.50805	3889	81	2016-12-18T05_28_30.668010_S5K.jpg
2016-12-18	05:28	Going down the slope a bit more.	15.48005	144.50808	3890	96	1482038922980S5K28794.jpg
2016-12-18	05:30	Looking upslope toward the target ORP site.	15.47992	144.50832	3899	13	2016-12-18T05_30_05.660654_S5K.jpg
2016-12-18	05:31	A few more animals.	15.48016	144.50838	3888	26	1482039074081S5K28945.jpg
2016-12-18	05:31	Flatter pillows.	15.48046	144.50834	3882	25	1482039112783S5K28984.jpg
2016-12-18	05:32	Did not see a signal on that transit.	15.48054	144.50822	3877	344	2016-12-18T05_32_44.651225_S5K.jpg
2016-12-18	05:33	Very smoky here and coming from the west.	15.48048	144.50826	3879	314	1482039182932S5K29054.jpg

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-18	05:33	Really smoky.	15.48043	144.50833	3882	296	1482039203912S5K29075.jpg
2016-12-18	05:34	Smoke but no signal and smoke is coming from the west.	15.48035	144.50812	3886	12	2016-12-18T05_34_18.649159_S5K.jpg
2016-12-18	05:35	Smokey but no ORP.	15.48034	144.50796	3888	68	1482039306945S5K29178.jpg
2016-12-18	05:36	ORP is climbing.	15.48030	144.50786	3889	322	
2016-12-18	05:36	Long tubes reaching down the hill in the aft camera.	15.48027	144.50781	3892	309	
2016-12-18	05:37	Can see Stump in rear camera.	15.48039	144.50770	3897	0	
2016-12-18	05:37	Going to head east from here.	15.48043	144.50768	3898	70	2016-12-18T05_37_32.680140_S5K.jpg
2016-12-18	05:38	Heading into the smoke	15.48028	144.50776	3899	124	2016-12-18T05_38_28.666241_S5K.jpg
2016-12-18	05:38	Small dip in ORP.	15.48021	144.50780	3902	125	2016-12-18T05_38_58.660699_S5K.jpg
2016-12-18	05:39	Temp is coming up and ORP is coming down.	15.48007	144.50792	3906	99	2016-12-18T05_39_41.672840_S5K.jpg
2016-12-18	05:40	Turning to go north up the slope.	15.48002	144.50805	3904	67	1482039642024S5K29513.jpg
2016-12-18	05:42	Climbing up with no ORP signals.	15.48019	144.50810	3886	18	2016-12-18T05_42_00.681496_S5K.jpg
2016-12-18	05:42	Very smoky again at the top.	15.48025	144.50812	3882	1	1482039738704S5K29610.jpg
2016-12-18	05:42	Now going to head west.	15.48028	144.50812	3879	6	2016-12-18T05_42_31.681936_S5K.jpg
2016-12-18	05:43	Lots of smoke from the diffuse flow.	15.48037	144.50807	3881	296	2016-12-18T05_43_14.653915_S5K.jpg
2016-12-18	05:44	Heading west and going down the slope over pillows.	15.48038	144.50794	3887	279	2016-12-18T05_44_11.669115_S5K.jpg
2016-12-18	05:44	No view forward but seeing pillows going down the slope.	15.48039	144.50788	3894	274	
2016-12-18	05:45	Going to move SW to get in the flats.	15.48041	144.50785	3900	253	
2016-12-18	05:45	Back to the line of chimneys when turned to look south.	15.48037	144.50781	3909	171	1482039938835S5K29810.jpg
2016-12-18	05:46	Down at the base of the pillow mound and exploring.	15.48036	144.50769	3919	189	1482040013953S5K29885.jpg
2016-12-18	05:47	Pillows with sediment.	15.48030	144.50757	3919	219	2016-12-18T05_47_31.678800_S5K.jpg
2016-12-18	05:47	Turning west now.	15.48027	144.50755	3920	254	2016-12-18T05_47_44.665150_S5K.jpg
2016-12-18	05:47	Moving toward some mounds in the bathymetry.	15.48025	144.50749	3919	276	2016-12-18T05_47_56.669851_S5K.jpg
2016-12-18	05:48	Shattered pillows and some white stains.	15.48028	144.50741	3916	296	2016-12-18T05_48_18.663469_S5K.jpg
2016-12-18	05:48	At the scarp that runs N-S.	15.48031	144.50733	3914	302	2016-12-18T05_48_37.677822_S5K.jpg
2016-12-18	05:48	Following the scarp to the south.	15.48032	144.50730	3911	240	1482040132903S5K30004.jpg
2016-12-18	05:49	Doesn't look active here. Lots of pillows and intact basalt across the scarp.	15.48027	144.50727	3911	203	2016-12-18T05_49_12.678786_S5K.jpg
2016-12-18	05:49	Wow...big scarp.	15.48020	144.50726	3914	196	2016-12-18T05_49_37.670619_S5K.jpg

Date	Time	S49 - Perseverance - Observations	Latitude	Longitude	Depth	Gyro	Image
2016-12-18	05:50	Driving along the scarp.	15.48000	144.50721	3911	199	2016-12-18T05_50_15.679932_S5K.jpg
2016-12-18	05:50	Going east.	15.47995	144.50721	3910	182	1482040225911S5K30097.jpg
2016-12-18	05:50	8 minutes left.....	15.47991	144.50727	3906	104	
2016-12-18	05:51	Coming up on some anemones and squat lobsters.	15.47989	144.50737	3912	105	
2016-12-18	05:52	Small chimneys and diffuse flow.	15.47987	144.50751	3912	110	2016-12-18T05_52_22.674618_S5K.jpg
2016-12-18	05:53	Heading back to Leaning Tower to leave a marker.	15.47975	144.50766	3909	256	2016-12-18T05_53_35.681808_S5K.jpg
2016-12-18	05:53	Line of diffuse flow.	15.47984	144.50761	3908	9	1482040438037S5K30309.jpg
2016-12-18	05:54	Going to leave a marker at the Palisades.	15.47996	144.50765	3907	45	1482040468745S5K30340.jpg
2016-12-18	05:54	Marker will be placed here.	15.47998	144.50768	3910	48	2016-12-18T05_54_47.684797_S5K.jpg
2016-12-18	05:55	Stowing the HFS wand at the same time. 5 minutes left on bottom.	15.48001	144.50769	3911	47	2016-12-18T05_55_08.671119_S5K.jpg
2016-12-18	05:55	Nice view of the Palisades.	15.48001	144.50767	3913	47	2016-12-18T05_55_50.682929_S5K.jpg
2016-12-18	05:56	Grabbing a marker from the STBD side of the sled.	15.48000	144.50766	3913	48	1482040573964S5K30445.jpg
2016-12-18	05:56	Marker 255.	15.47997	144.50767	3914	49	1482040615777S5K30487.jpg
2016-12-18	05:57	DEPLOY Mkr-255 at Palisades.	15.47997	144.50768	3914	22	2016-12-18T05_57_18.662315_S5K.jpg
2016-12-18	06:00	<i>SuBastian</i> was here!	15.47998	144.50763	3916	55	2016-12-18T05_59_59.658999_S5K.jpg
2016-12-18	06:00	Coming off the bottom...bye-bye.	15.47998	144.50759	3909	52	2016-12-18T06_00_40.662407_S5K.jpg
2016-12-18	06:01	HD off.	15.47996	144.50756	3899	304	2016-12-18T06_01_33.685117_S5K.jpg