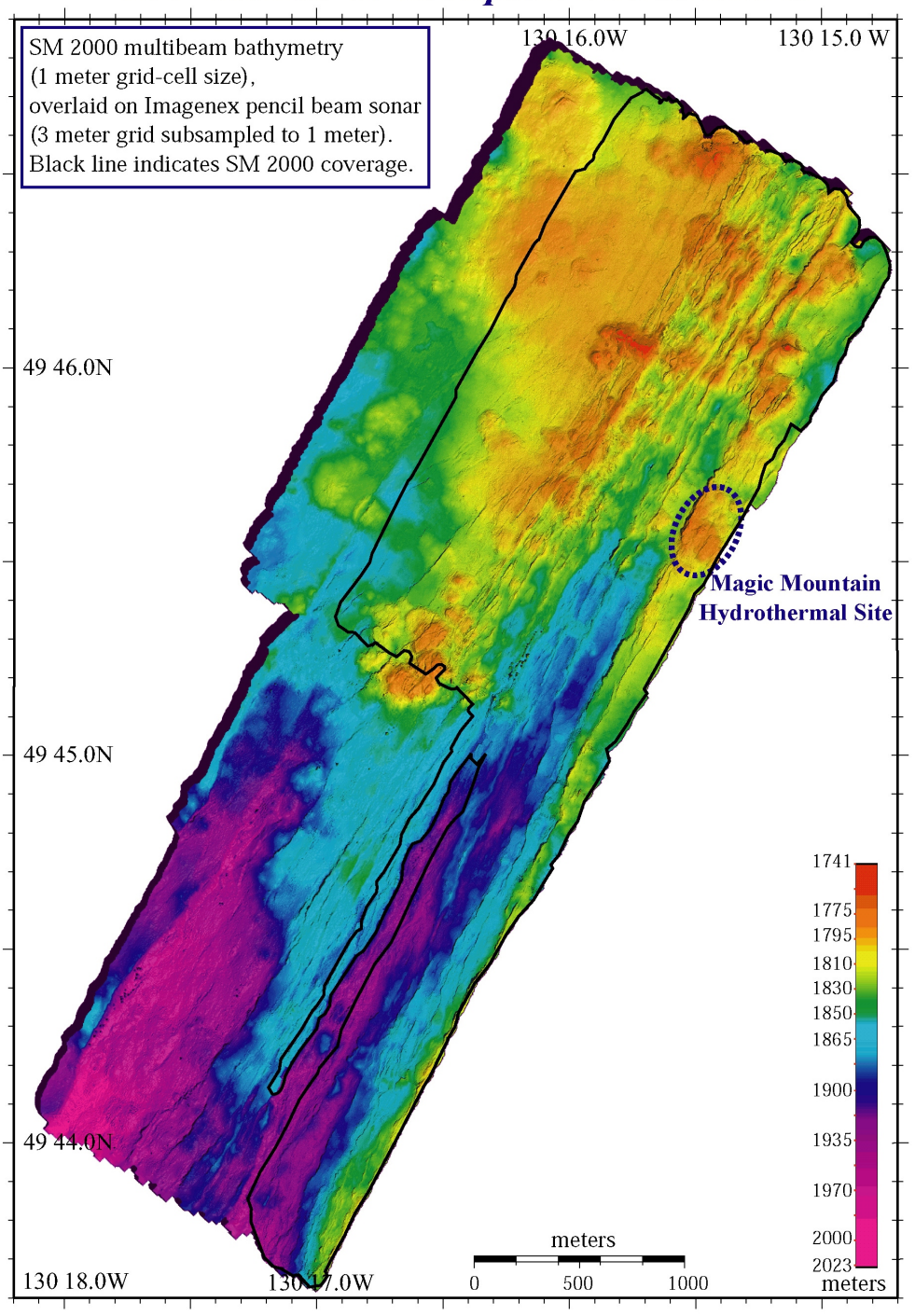
EXPLORE

Submarine Ring of 2002 - Explorer Ridge

R/V Thomas G. Thompson Cruise TN149



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Cover: SM200 multibeam and Imagenex pencil-beam bathymetry at Explorer Ridge.

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TN149 CRUISE SCHEDULE AT EXPLORER RIDGE
VENTS 2002, TGT-02-0013

All logged times are UTC (Greenwich). PST (Pacific Standard Time) added when appropriate.

LEG 1

On site at Explorer:
6/30 1800 UTC (6/30 1100 PST) – 7/10 1400 UTC (7/10 0700 PST)

Explorer to Victoria transit:
7/10 1830 UTC (7/10 1130 PST) – 7/11 0800 UTC (7/11 0100 PST)

Leg 1 PRIMARY OPERATIONS:
- CTD casts and tow-yos using 20-L Niskin rosette
- EM300 surveys
- ABE surveys
- Rock coring

LEG 2B

Change out some members of the scientific crew in Victoria:
7/23 morning

Collect EM300 data on the shelf on way to Explorer Ridge:
7/24 0100 UTC (7/23 1800 PST) – 7/24 2000 UTC (1300 PST)

On site at Explorer Ridge (ROPOS dives R664 – R671):
7/24 2030 UTC (1330 PST) – 8/1 2100 UTC (1400 PST)

Leg 2B PRIMARY OPERATIONS:
- Dives with the ROPOS Remotely Operated Vehicle (ROV)

STATISTICS - EXPLORER RIDGE 2002

Abe Wet Time (Leg 1)

abe73 7/1/02 1847 - 7/2/02 0603	11 hours 16 minutes	[11.27 hrs]
abe74 7/2/02 2206 - 7/3/02 0701	8 hours 55 minutes	[8.92 hrs]
abe75 7/3/02 2220 - 7/4/02 0705	8 hours 45 minutes	[8.75 hrs]
abe76 7/5/02 0508 - 7/5/02 1852	13 hours 44 minutes	[13.73 hrs]
abe77 7/6/02 1330 - 7/7/02 0411	14 hours 41 minutes	[14.68 hrs]
abe78 7/7/02 2305 - 7/8/02 1256	13 hours 51 minutes	[13.85 hrs]
abe79 7/9/02 0445 - 7/9/02 1814	13 hours 29 minutes	[13.48 hrs]
Total Wet Time:	**84 hours 41 minutes**	**[84.68 hrs]**

Wax Core Summary (Leg 1)
6 locations
8 cores
22.5 grams of glass recovered

CTD Summary (Leg 1)
17 Vertical Casts
11 Tow-Yo's

ROPOS Dives R664 - R671 Explorer Ridge (Leb 2b)
Dive R663 was a ballast dive with no bottom time**.**
8 dives with bottom time.
Total Wet Time: 109 hours 53 minutes [109.89 hrs]
Total Bottom Time: 88 hours 10 minutes [88.17 hrs]

ROPOS Sample Summary at Explorer Ridge (Leg 2b)
R664 3 samples (1 SF, 2 net)
R665 30 samples (19 HFS, 6 SS, 2 GTB, 2 net, 1 RK)
R666 15 samples (8 SS, 2 net, 2 RK, 1 SF, 1 TWG, 1 MP)
R667 3 samples (1 RK, 2 net)
R668 8 samples (5 RK, 2 net, 1 MP)
R669 37 samples (22 HFS, 7 SS, 2 GTB, 3 SF, 1 RK, 2 net)
R670 18 samples (8 SS, 4 BT, 1 RK, 1 TWG, 2 net, 2 MP)
R671 8 samples (2 SS, 5 RK, 1 MP)
Total 122 samples
41 HFS - hot fluid samples (RAS); 31 SS - suction samples; 4 GTB - gas tight bottles; 16 RK - rock (basalt); 5 SF - sulfide; 4 BT - bacterial traps; 2 TWG - tubeworm grabs; 14 net - plankton net tows; 5 MP - McLane pump (filters for larvae)

SCIENTIFIC PARTY AND AFFILIATIONS

Leg 1 Scientific Party	Title	Affiliations
Bob Embley (Co-Chief Scientist)	Geologist	NOAA Pacific Marine Environmental Laboratory - Newport, Oregon, USA
Ed Baker (Co-Chief Scientist)	Physical Oceanographer	NOAA Pacific Marine Environmental Laboratory - Seattle, Washington, USA
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Shane Lovelace	Sampling Tools and Navigation	CSSFS - Sidney, British Columbia, CANADA

LEG 1 SCIENTIFIC PARTY

LEG 2B SCIENTIFIC PARTY

Explorer Ridge Hydrothermal Vents	**POSITIONS APPROXIMATE**				
Vent	Long (W)	Lat (N)	UTM X	UTM Y	Depth (m)
Anhydrite	-130.25809654	49.75943869	409388	5512644	1782
Anhydrite1	-130.25831343	49.75869876	409371	5512562	1797
Anhydrite2	-130.25792408	49.75867601	409399	5512559	1785
Anhydrite3	-130.25782970	49.75878497	409406	5512571	1782
Anhydrite4	-130.25819316	49.75887997	409380	5512582	1787
Beercan	-130.25782730	49.75976543	409408	5512680	1774
DeadChimney	-130.25587850	49.76065007	409550	5512776	
Digit	-130.25841726	49.75841880	409363	5512531	1802
Digit2	-130.25845937	49.75843633	409360	5512533	1802
EasterIsland-m79	-130.25904455	49.75905061	409319	5512602	1784
Einstein-m81	-130.25933791	49.75911938	409298	5512610	1796
Limpet	-130.25772618	49.75961361	409415	5512663	1778
LuckyFind	-130.25688546	49.76146667	409479	5512868	1792
Majestique	-130.25817370	49.75866430	409381	5512558	1794
Obelisk	-130.25829630	49.75857302	409372	5512548	1800
OchreGarden	-130.26254325	49.75636807	409062	5512308	
oldarea	-130.25663600	49.75718786	409489	5512392	1852
Recordbreaker-M72	-130.25603973	49.76044144	409538	5512753	1816
Ridgetop	-130.25883680	49.75907086	409334	5512604	1778
Runaround-m59	-130.25779768	49.75969379	409410	5512672	1776
Stump	-130.25794137	49.75988112	409400	5512693	1770
Tubeworm-m73	-130.25760939	49.75992970	409424	5512698	1780
Wood-m51	-130.25759830	49.76003776	409425	5512710	1785
Zeus	-130.25591317	49.76037985	409547	5512746	1815
Zooarium	-130.25577349	49.76088507	409558	5512802	1797

EXPLORER RIDGE CTD STATION LOCATIONS (Leg 1)

T02B-xx = CTD Tow-yo
V02B-xx = CTD Vertical Cast

Cast	Start Date/Time	StaName	Lat (dec.deg)	Long (dec.deg)	Lat (deg)-N	Lat (min)-N	Long (deg)-W	Long (min)-W
1	April 2, 1974 (10:22am)	V02B-01	49.75399	-130.22833	49	45.2393	130	13.7000
2	May 6, 2036 (10:22am)	V02B-02	49.75995	-130.25995	49	45.5970	130	15.5970
3	May 7, 2116 (10:22am)	V02B-03	49.76733	-130.27500	49	46.0400	130	16.5000
4	January 20, 1942 (10:22am)	T02B-01(start)	49.81583	-130.20751	49	48.9496	130	12.4503
		T02B-01(end)	49.66563	-130.33525	49	39.9380	130	20.1150
5	February 9, 2064 (10:22am)	T02B-02(start)	49.66621	-130.33579	49	39.9723	130	20.1475
		T02B-02(end)	49.59253	-130.39862	49	35.5520	130	23.9170
6	December 19, 1970 (10:22am)	T02B-03(start)	49.59242	-130.40011	49	35.5451	130	24.0064
		T02B-03(end)	49.51288	-130.46122	49	30.7730	130	27.6730
7	June 21, 2073 (10:22am)	T02B-04(start)	49.83000	-130.15750	49	49.8000	130	9.4500
		T02B-04(end)	49.97302	-130.22867	49	58.3810	130	13.7200
8	December 20, 1947 (10:22am)	V02B-04	49.92575	-130.27417	49	55.5447	130	16.4501
9	August 23, 1981 (10:22am)	T02B-05(start)	49.95266	-130.22229	49	57.1593	130	13.3373
		T02B-05(end)	50.04138	-130.26666	50	2.4828	130	15.9993
10	June 7, 2133 (10:22am)	V02B-05	50.31831	-130.19005	50	19.0984	130	11.4028
11	August 1, 1928 (10:22am)	V02B-06	50.20006	-130.26515	50	12.0034	130	15.9087
12	July 21, 1953 (10:22am)	V02B-07	50.12176	-130.26506	50	7.3057	130	15.9035
13	January 28, 2009 (10:22am)	V02B-08	49.76666	-130.26259	49	45.9995	130	15.7556
14	November 23, 2055 (10:22am)	V02B-09	50.06800	-129.76517	50	4.0800	129	45.9100
15	August 25, 2095 (10:22am)	V02B-10	50.00668	-129.89002	50	0.4010	129	53.4010
16	August 2, 1905 (10:22am)	V02B-11	49.76017	-130.26063	49	45.6102	130	15.6380
17	January 10, 2001 (10:22am)	V02B-12	49.93333	-129.94667	49	56.0000	129	56.8000
18	June 23, 2027 (10:22am)	V02B-13	49.89333	-130.10000	49	53.6000	130	6.0000
19	October 24, 2095 (10:22am)	V02B-14	49.73250	-130.28583	49	43.9500	130	17.1500
20	November 27, 2123 (10:22am)	T02B-06(start)	49.74169	-130.20666	49	44.5011	130	12.3994

Cast	Start Date/Time	StaName	Lat (dec.deg)	Long (dec.deg)	Lat (deg)-N	Lat (min)-N	Long (deg)-W	Long (min)-W
		T02B-06(end)	49.79056	-130.34705	49	47.4334	130	20.8232
21	January 30, 1963 (10:22am)	T02B-07(1st point))	49.76075	-130.26245	49	45.6450	130	15.7470
		T02B-07(2nd point)	49.76268	-130.26033	49	45.7610	130	15.6200
		T02B-07(3rd point)	49.76368	-130.26333	49	45.8210	130	15.8000
22	August 7, 2007 (10:22am)	V02B-15	49.77254	-130.26750	49	46.3526	130	16.0499
23	January 3, 2071 (10:22am)	T02B-08(start)	50.15317	-130.22667	50	9.1900	130	13.6000
		T02B-08(end)	50.06193	-130.34005	50	3.7160	130	20.4030
24	January 1, 1957 (10:22am)	T02B-09(start)	49.72321	-130.25852	49	43.3924	130	15.5112
		T02B-09(end)	49.76140	-130.35955	49	45.6839	130	21.5728
25	December 17, 2016 (10:22am)	T02B-10(start)	49.77083	-130.23333	49	46.2500	130	14.0000
		T02B-10(end)	49.68717	-130.31033	49	41.2300	130	18.6200
26	August 25, 2072 (10:22am)	T02B-11(start)	49.77667	-130.25917	49	46.6000	130	15.5500
		T02B-11(end)	49.73167	-130.30150	49	43.9000	130	18.0900
27	September 1, 1945 (10:22am)	V02B-16	49.67580	-130.32890	49	40.5480	130	19.7341
28	July 13, 1966 (10:22am)	V02B-17	49.73887	-130.28245	49	44.3322	130	16.9472

WAX ROCK CORING PROGRAM AT EXPLORER RIDGE (Leg 1)

Brian Cousens

The igneous petrology and geochemistry of basaltic rocks from Explorer Ridge are poorly understood due to a lack of sampling compared to other nearby segments of the Juan de Fuca Ridge (e.g., the Endeavour Segment). A regional study of basalt petrology was published by Cousens et al. (1984), but only the area around Magic Mountain has been sampled in detail for igneous rocks (Michael et al. 1989; Shea, 1987). This cruise offered the opportunity to improve the density of sampling at Explorer Ridge, using the ROPOS vehicle where possible and a small program of rock coring between dives.

The rock coring technique utilizes a five foot long, weighted core barrel that has a specially designed plate at its end to hold five cylindrical cutters that are filled with a paraffin wax. Upon impact with glassy basaltic lavas on the sea floor, the glassy surface is broken by the cutter edges and glass chips are embedded in the wax. The corer also has wax-filled "teeth" welded onto the ends of the four stabilizer fins of the corer so that the teeth will break a glassy basalt surface when the corer falls sideways after impact on the sea floor. When retrieved, the wax is removed from the cutters and the fins and is placed in a hot drink cup. The cup is partially filled with water, placed in a microwave oven, and heated until the water is nearly boiling. The wax melts, floats to the top of the water, and the trapped glass chips fall to the bottom of the cup. The wax is decanted off, the glass chips are rinsed in boiling water several times to remove any remaining wax film on the chips, and the chips are then placed in a plastic dish and allowed to dry.

During this cruise, the rock corer was modified to add weight to the nose of the corer and the existing bolts used to hold the five cutters in place were replaced with set screws.

Given the likelihood that there would be minimal downtime for ROPOS, a geologic problem was chosen that would require only a small number of samples. Ultimately, only six coring stations were occupied, and glass chips were recovered at all six stations. Sampling concentrated on the Seminole Segment (Michael et al., 1989), a shallow ridge that parallels South Explorer Ridge on its east side between approximately 49o44'N and 49o48'N. The origin of this ridge is uncertain; it has been proposed to be either a propagating ridge or a seamount. Propagating ridges have chemically distinctive basalts near the ridge tip, and no samples from the ridge tip have been collected until now.

Rock Core 1 49°45.0'N, 130°11.3'W Depth 2040m
Target: Top of a large seamount, east side of Seminole Segment.
Results: Two corer casts recovered 1.5g of small, fresh to weathered glass chips, mostly less than 1mm in size. The wax in the fins was smeared with mud, and I interpret this seamount to be sediment-covered and relatively old.

Rock Core 2 49°44.5'N, 130°11.6'W Depth 2160m
Target: A small knoll directly southwest of rock core station 1.
Results: Two casts recovered 3.5g of fresh glass chips, including three chips > 3mm in size. Chips were recovered from both the cutters and the fins. This knoll is much fresher, and perhaps younger, than the seamount at station 1.

Rock Core 3 49°45.1'N, 130°13.2'W Depth 2060m
Target: A small ridge between the Seminole Segment and the main South Explorer Ridge.

Results: One cast recovered 4.5g of very fresh glass, including many chips > 2 mm in size. Chips were recovered from both the cutters and the fins. The area between the Seminole Segment and the main ridge includes young lavas.

Rock Core 4 49°46'N, 130°13.0'W Depth 2020m
Target: A small ridge between the Seminole Segment and the main South Explorer Ridge, north of station 3.
Results: One cast recovered 3.0g of very fresh glass chips, including two large fragments > 3mm in size. Chips were recovered from both the cutters and the fins. Again, the area between Seminole and South Explorer Ridge includes young lavas.

Rock Core 5 49°45.5'N, 130°13.7W Depth 2015m
Target: A small ridge between the Seminole Segment and the main South Explorer Ridge, southwest of station 4.
Results: One cast yielded 8.0g of fresh glass chips, including one fragment that is > 1cm in size. Chips were recovered exclusively from the cutters. This ridge (which includes station 4) is composed of young lavas.

Rock Core 6 49°47.45'N, 130°14.5'W Depth 1805m
Target: A small lava shield on the west flank of the main South Explorer Ridge.
Results: One cast produced 2g of variably altered glass chips, consisting mostly of five fragments of ~ 4mm size. Although this lava flow shows up well in the EM300 reflectivity map, the glass is more altered than from other rock coring stations and the flow is interpreted to be older than flows of the Seminole Segment and adjacent South Explorer Ridge.

Summary: Basalt glass was recovered from six localities that form a cross-section over the Seminole Segment and the main South Explorer Ridge from southeast to northwest. These samples, as well as samples of basalt collected by ROPOS during this cruise, will undergo major element, trace element, and radiogenic isotope analysis at Carleton University over the next few months.

Acknowledgments: Thanks to the marine technicians Rob and Mike for their invaluable help, and to Cathy Channing and Kathy Gillis for "wax on, wax off" duty!

References:
Cousens, B.L., Chase, R.L., and Schilling, J.-G., 1984. Basalt geochemistry of the Explorer Ridge area, northeast Pacific Ocean. Can. J. Earth Sci. 31, 157-170.
Michael, P.J., Chase, R.L., and Allan, J.F., 1989. Petrologic and geologic variations along the Southern Explorer Ridge, northeast Pacific Ocean. J. Geophys. Res. 94, 13,895-13,918.
Shea, G.F.T., 1987. Study of basalts from the Magic Mountain hydrothermal area, southern Explorer Ridge, northeast Pacific Ocean. M.Sc. thesis, University of British Columbia, Vancouver.

TOTAL ROPOS SAMPLES COLLECTED AT EXPLORER RIDGE (Leg 2b)

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R664								
R664-SF-0001	SW of Magic Mtn ~ 100 m	1850	17	01:33:45 Jul 26 2002	Chimney branches at top, which are typical of a polymetallic sulphide sample. Chimney heavily rotted. Oxidation rim zoned/laminated. Interior consists of powdery pyrite. Note reflective central crystals of pyrite		Williams-Jones	Cousens
R664-net-port-0002	periphery of Magic Mtn	1844	88	23:18:00 Jul 25 2002	Port net (180 um). 2318 opened net. 2-20m above bottom. 2334 closed. 2357 opened. Stopped 5 min with nets open. 0012 closed. 0042 opened. 0157 closed. 0200 opened. 0219 closed. End of port net sample. Net unable to open.		Tunnicliffe	
R664-net-stbd-0003	periphery of Magic Mtn	1794	301	23:18:00 Jul 25 2002	Stbd net. 2318 opened net. 2-20m above bottom. 2334 closed. 2357 opened. Stopped 5 min with nets open. 0012 closed. 0042 opened. 0157 closed. 0200 opened. 0219 closed. 0223 opened. 0224 closed. 0225		Metaxas	Tunnicliffe
R665								
R665-HFS-16-0001	Einstein	1798	49	05:50:04 Jul 27 2002	HFS bag#16. Start 0549 End 0557. Logged Vol=714ml. Weighted Vol=330ml. pH=5.74. Bag broke, lost lots of sample.	Tmax=53.9 Tmin=17 Tavg=30.5	Butterfield	
R665-HFS-17-0002	Einstein	1798	49	06:03:21 Jul 27 2002	HFS filtered bag#17. Start 0603 End 0611. Logged Vol=720ml. Weighted Vol=640ml. pH=4.83. Small, hot vent.	Tmax=162.3 Tmin=75 Tavg=103.2	Butterfield	
R665-HFS-21-0003	Einstein	1798	48	06:12:44 Jul 27 2002	HFS FISH filter#21. Start 0612 End 0619. Logged Vol=629ml.	Tmax=160.3 Tavg=101	Butterfield	Bolten
R665-HFS-24-0004	Einstein	1798	48	06:20:53 Jul 27 2002	HFS gas piston#24. Start 0620 End 0624. Logged Vol=125ml. Weighted Vol=300ml.	Tmax=108.8 Tavg=56.3	Butterfield	Evans
R665-HFS-6-0005	Einstein	1798	50	06:27:35 Jul 27 2002	HFS Sterivex-DNA filter#6. Start 0627 End 0637. Logged Vol=1040ml.	Tmax=80.7 Tavg=70.1	Butterfield	Bolten
R665-HFS-10-0006	Einstein	1798	53	06:54:35 Jul 27 2002	HFS RNA filter#10. Start 0654 End 0708. Logged Vol=1393ml.	Tmax=48.1 Tavg=42.9	Butterfield	Bolton
R665-GTB-12-0007	Einstein	1798	55	06:57:02 Jul 27 2002	Starboard gas tight bottle#12. Start 06:56 Close 06:58.		Evans	Butterfield/ Lilley
R665-SS-J1-0008	Einstein	1798	26	07:37:21 Jul 27 2002	Suction sample of sulphide worms into jar#1. Start 0737 End 0743.		Leveille	
R665-SS-J2-0009	Einstein	1798	46	08:14:44 Jul 27 2002	Second suction of sulphide worms into jar#2. Start 0814 End 0819.	Alien T=10	Leveille	
R665-SS-J3-0010	Einstein	1798	195	08:32:42 Jul 27 2002	Suction white bacterial filaments into jar#3. Start 0831 End 0840. Start2 0849 End2 0854. Alien Tmax=6.2 T2=3-5.	Alien Tavg=3-5	Moyer	Lee
R665-SS-J4-0011	Einstein	1799	65	09:14:28 Jul 27 2002	Suction for gastropods into jar#4. Start 0914 End 0915. Start2 0917 End2 0926.	Alien T=0-1	Bates	
R665-SS-J5-0012	Einstein	1799	51	09:33:22 Jul 27 2002	Suctioning high flow gastropods. Start 09:33 End 09:35.		Bates	
R665-HFS-19-0013	Ridge Top	1778	81	10:27:49 Jul 27 2002	HFS bag#19 Start 1027 Stop 1034. Logged Vol=657ml. Weighted Vol=657ml. pH=4.39.	Tmax=287.7 Tavg=275.3	Butterfield	

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R665-GTB-6-0014	Ridge Top	1778	80	10:28:52 Jul 27 2002	Port side gas tight bottle#6. Instant sample.		Evans	Butterfield/ Lilley
R665-HFS-22-0015	Ridge Top	1778	78	10:38:19 Jul 27 2002	HFS gas piston#22. Start 1037 Stop 1038. Weighted Vol=118ml.	Tmax=261.3 Tavg=255	Butterfield	Evans
R665-HFS-20-0016	Ridge Top	1778	79	10:41:08 Jul 27 2002	HFS gas piston#20 in clear smoker. Start 10:40 Stop 10:44. Logged Vol=431ml. Weighted Vol=425ml. pH=5.34. Stopped to shake the intake	Tmax=243.4 Tavg=125.7	Butterfield	Evans
R665-HFS-11-0017	Anhydrite	1783	119	11:49:00 Jul 27 2002	HFS filtered bag#11 in clear smoker on anhydrite/sulfide mound. Start 1130 Stop 1157. Logged Vol=604ml. Measured Vol=680ml. pH=4.54.	Tmax=255.6 Tavg=167	Butterfield	
R665-HFS-8-0018	Tubeworm	1780	211	13:16:58 Jul 27 2002	HFS bag#8 in the tubeworm hot tub. Start 1316 Stop 1323. Logged Vol=650ml. Measured Vol=230ml.	Tmax=79 Tavg=77	Butterfield	
R665-HFS-12-0019	Tubeworm	1780	214	13:25:39 Jul 27 2002	HFS Sterivex-DNA filter#12 in the tubeworm hot tub. Start 1325 Stop 1335. Logged Vol=1004ml.	Tmax=77.6 Tavg=68	Butterfield	Bolton
R665-HFS-15-0020	Tubeworm	1780	214	13:36:30 Jul 27 2002	HFS FISH filter#15 in the tubeworm hot tub. Start 1336 Stop 1341. Logged Vol=486ml.	Tmax=69.6 Tavg=67.6.	Butterfield	Bolton
R665-HFS-13-0021	Tubeworm	1780	214	13:43:44 Jul 27 2002	HFS RNA filter#13 in the tubeworm hot tub. Start 1343 Stop 1352. Logged Vol=1006ml.	Tmax=77.5 Tavg=67.3	Butterfield	Bolton
R665-HFS-14-0022	Tubeworm	1780	215	13:53:51 Jul 27 2002	HFS bag#14 at base of tubeworm clump. Start 1354 Stop 1400. Logged Vol=713ml. Weighted Vol=760. pH=6.	Tmax=21.2 Tavg=18.2	Butterfield	
R665-HFS-9-0023	Run Around	1771	34	16:41:53 Jul 27 2002	HFS bag#9 in small north chimney on Merlin Mound area. Start 1647 End 1652. Logged Vol=621ml. Weighted Vol=790. pH=4.42	Tmax=229.9 Tavg=200.5	Butterfield	
R665-HFS-23-0024	Run Around	1771	34	16:58:03 Jul 27 2002	HFS gas piston#23 in small north chimney on Merlin Mound area. Start 1705:50 Stop 1706:44. T1=221 T2=82. Weighted Vol=139ml.	Tmax=235.8 Tavg=216	Butterfield	Evans
R665-HFS-4-0025	Run Around	1771	46	17:09:36 Jul 27 2002	HFS gas piston#4 at small north chimney on Merlin Mound area. Start 1708 Stop 1713:40. Logged Vol=588	Tmax=247.6 Tavg=219.9	Butterfield	Evans
R665-SS-J6-0026	Run Around	1772	5	17:30:11 Jul 27 2002	Suctioned white bacterial mats. Slurped a couple minutes and will slurp more nearby. Slurping and repositioning here and there near Mkr-59. Start 1731 Stop 1757.		Moyer	
R665-net-port-0027	transit E to W across rift zone	1822	280	19:22:56 Jul 27 2002	Port larval net open at about 2-5 meters above the bottom traveling at an average of 0.5 knot. The larval nets were opened 1922 and closed at ~1953. 180um net.		Metaxas	
R665-net-stbd-0028	transit E to W across rift zone	1799	275	19:25:40 Jul 27 2002	Starboard larval net open (simultaneous to R665-net-0027) at about 2-5 meters above the bottom traveling at an average of 0.5 knot. The		Metaxas	
R665-RK-0029	W of rift valley on top of summit	1742	340	00:08:30 Jul 28 2002	Pillowed basalt placed in pouch. Located right on top of the summit. South of thermal anomaly T9.		Gillis/ Williams-Jones	

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
HFS-18-0030	water column on ascent	1746	340	00:22:20 Jul 28 2002	HFS bag#18 for seawater blank collected on ascent. Start 2330 Stop 2340. Logged Vol=700ml. Weighted Vol=690. pH=6.54. [409665/5513598]	Tmax=6 Tavg=5.	Butterfield	
R666								
R666-net-01-0001	Tubeworm	1774	16	09:28:21 Jul 28 2002	Starboard net open above chimney. Traveling 16m above bottom at a speed of 1 knot. Start 0928 Stop 0959. Total		Metaxas/ Tunnicliffe	
R666-net-02-0002	Tubeworm	1775	15	09:29:29 Jul 28 2002	Port net open above chimney. Traveling 16m above bottom at a speed of 1 knot. Start 0928 Stop 0959. Total time 31 min.		Metaxas/ Tunnicliffe	
R666-SS-J1-0003	Tubeworm	1781	182	10:36:28 Jul 28 2002	Suction of particulate matter from tubeworm bush into jar#1. Start 1035		Leveille	
R666-TWG-01-0004	Tubeworm	1781	160	11:21:03 Jul 28 2002	Tubeworm grab (Ridgea) into port bio-box.		Tunnicliffe/ Bates	Vrijenhoek/ Moyer
R666-SS-J2-0005	Tubeworm	1782	216	11:38:37 Jul 28 2002	Suction sample of gastropods from low flow into jar#2. Start 1138 End 1141. Start2 1143 End2 1145.		Bates	
R666-SS-J4-0006	Tubeworm	1780	265	11:56:07 Jul 28 2002	Suction of high-flow limpets on large phlange into jar#4. Start 1201 End 1207.		Bates	Csotonyi/ Moyer
R666-SS-J3-0007	Tubeworm	1780	257	12:23:56 Jul 28 2002	Suction of dense white bacterial mat into jar#3. Start 1218 stop 1222.		Moyer	
R666-SS-JJ1-0008	Tubeworm	1780	257	12:32:58 Jul 28 2002	Suction sample of bacterial mat into jar#J1. Start 1225 Stop 1232.		Moyer	
R666-MP-0009	Tubeworm	1759	200	13:06:20 Jul 28 2002	McLane pumping at 8500ml/min. Actual pump rate is closer to 8.0 liters/min. Flying a few meters above Tubeworm chimney. Start 1243 Stop 1306. Vol=186 liters.		Leveille	
R666-SS-JJ2-0010	Run Around	1772	208	14:07:40 Jul 28 2002	Suction the white mat covered top of Runaround for sulfide worms into Jar#J2. Start 1407 Stop 1410. Start2 1415 Stop2 1417. Chimney top fell over at 1417.	Alien T=38	Leveille	
R666-RK-0011	Einstein	1800	35	16:59:31 Jul 28 2002	Radially-fractured basalt fragment from the base of mound, just below the sulfide/basalt boundary. Small piece (triangular) that's highly oxidized. Placed in the center of purse.		Gillis/ Channing	Williams-Jones
R666-RK-0012	Einstein	1798	41	17:12:38 Jul 28 2002	Oxidized piece of basalt or sulfide farther up slope on the sulfide mound. Highly friable. Put in the purse.		Gillis/ Channing	
R666-SF-0013	Ridge Top	1775	8	18:09:33 Jul 28 2002	Cleopatra's needle into the biobox. Willie says that it's probably a sulfate		Williams-Jones / Leveille	Cousens/ Csotonyi
R666-SS-JJ3-0014	Lucky Find	1791	322	21:55:49 Jul 28 2002	Sulfide worm suction into jar#J3. Start1 2157 End1 2159. Start2 2200 End2 2202. Start3 2202:48 End3 2205. Start4 2208 End4 2209.		Csotony	
R666-SS-J4-0015	Lucky Find	1792	313	22:09:46 Jul 28 2002	A few more sulfide worms into the "flush" bottle#J4. Start 22:10 End 22:13.		Lee	
R667								
R667-RK-0001	Central Seamount	1780	327	17:04:38 Jul 29 2002	Collected a piece of fractured pillow basalt. Sample is a little over 10 cm.		Cousens/ Williams-Jones	

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R667-net-port-0002	across rift valley from W to E	1800	51	18:26:44 Jul 29 2002	Port net tow from the base of Central Seamount across the valley to Einstein. Open 1845. Close and cinch 1917. Transit 20-25m off the bottom. From W side of rift to Einstein.		Metaxas	
R667-net-stbd-0003	across rift valley from W to E	1783	64	18:38:18 Jul 29 2002	Stbd net tow from the base of central seamount across the valley to Einstein. Open 1845. Close and cinch 1917. Transit 20-25m off the bottom. From W side of rift to Einstein.		Metaxas	
R668								
R668-RK-0001	~300m SE of MM	1847	326	03:23:35 Jul 30 2002	Several pac-man samples of sections of old chimney placed in port side bio-box (oxides?). Start 0323 stop 0348. Old hydrothermal area. [409489/5512392]		Williams-Jones / Leveille	Csotonyi/ Cousens/ Moyer
R668-net-port-0002	Einstein	1790	358	04:56:16 Jul 30 2002	Port side net tow flying at a 10m radius around Einstein 5m above bottom. Speed 1 knot. Start 0455 stop 0525.		Metaxas	
R668-net-stbd-0003	Einstein	1790	233	04:58:52 Jul 30 2002	Starboard side net tow - flying at a 10m radius around Einstein, 5m above bottom. Speed 1 knot. Start 0455 end 0525. Total time 30 min. (63 um)		Metaxas	
R668-MP-0004	Einstein	1790	336	04:59:47 Jul 30 2002	McLane pump sample taken while flying at a 10m radius around Einstein, 5m above bottom. Speed 1 knot. Start		Leveille	
R668-RK-0005	Easter Island	1793	353	07:45:41 Jul 30 2002	Sampled 10cm peace of fresh basalt pillow lava near the south contact of basalt and Mystic Mound. Sample placed in the purse.		Cousens	Channing
R668-RK-0006	Easter Island	1790	112	08:40:54 Jul 30 2002	Piece of altered basalt in the lower few meters of mound that underlies the ridgetop. 20cm diameter. South contact		Gillis/ Channing	
R668-SF-0007	Ochre Garden	1878	279	10:15:30 Jul 30 2002	Highly altered piece of orchreous chimney, 300m SE of Mystic Mound. [Ship position 409062/5512308]		Leveille	Cousens/ Csotonyi/ Moyer
R668-RK-0008	Ochre Garden	1880	69	11:09:36 Jul 30 2002	Pac man sample of top of altered chimney with yellow staining. [Ship		Williams-Jones / Leveille	Cousens
R669								
R669-HFS-14-0001	Tubeworm	1782	323	01:05:16 Jul 31 2002	HFS bag#14 at the base of a tubeworm clump near the base of the chimney. Start 0126 Stop 0131. Logged Vol=601ml. Weighted Vol=760ml. pH=6.	Tmax=21.2 Tavg=18.2 T2ave=13	Butterfield	
R669-HFS-11-0002	Tubeworm	1782	272	01:33:42 Jul 31 2002	HFS bag#11. Start 0133 Stop 0139. T1SD=0.8. Logged Vol=602ml. Weighted Vol=750ml. pH=5.99.	Tmax=19.6 Tavg=18.4 T2avg=13	Butterfield	
R669-HFS-10-0003	Tubeworm	1782	271	01:40:54 Jul 31 2002	HFS RNA filter#10 down inside worm clump. Start 0142 Stop 0115. T1SD=2.5. Logged Vol=1025ml.	Tmax=18.8. Tavg=15.8 T2avg=12	Butterfield	Bolton
R669-HFS-12-0004	Tubeworm	1782	268	01:52:26 Jul 31 2002	HFS Sterivex-DNA filter#12. Start 0152 Stop 0204. T1SD=1.9. Logged Vol=1051ml.	Tmax=21.7 Tavg=19.6 T2avg=15	Butterfield	Bolton

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R669-HFS-013-0005	Tubeworm	1782	269	02:06:17 Jul 31 2002	HFS RNA filter#13 down inside worm clump. Start 0206 Stop 0210. T1SD=0.6. Logged Vol=465ml. T2avg=15. H2S changed by 0.35 volts relative to ambient. pH=6.0	Tmax=21.0. Tavg=20.9	Butterfield	Bolton
R669-SS-JJ1-0006	Tubeworm	1781	269	02:31:13 Jul 31 2002	Suction for particles in dead tubeworm bush into jar#J1. Lots of pycnogonids and buccionids. Start 0232 Stop 0239.		Leveille	
R669-SS-JJ2-0007	Tubeworm	1781	244	02:47:00 Jul 31 2002	Suction blue mat dominated by ciliates into jar#J2. Start 0249 Stop 0254.		Moyer	Csotonyi/ Bolton
R669-HFS-8-0008	Zooarium	1798	303	04:48:38 Jul 31 2002	HFS bag#8. The fluid sampler probe is positioned at the surface of the palm worms. Start 0448 Stop 0454. Logged Vol=559ml. Weighted Vol=550ml. pH=6.48.	Tmax=10.9 Tavg=10.0 T2avg=8	Butterfield	
R669-HFS-9-0009	Zooarium	1799	296	04:56:25 Jul 31 2002	HFS bag#9. The fluid sampler probe is positioned at the surface of the palm worms. Start 0456 Stop 0502. Logged Vol=601ml. Weighted Vol=790ml. pH=6.2.	Tmax=12.3 Tavg=11.2 T2avg=9	Butterfield	
R669-HFS-7-0010	Zooarium	1798	301	05:04:11 Jul 31 2002	HFS FISH filter#7. Start 0503 Stop 0508. Vol=474ml. Sample probe position is the same as for previous two samples.	Tmax=14 Tavg=12.2 T2=8	Butterfield	Bolton
R669-HFS-3-0011	Zooarium	1798	301	05:11:42 Jul 31 2002	HFS Sterivex-DNA filter#3. Start 0511 End 0527. Logged Vol=1184ml. Sample probe position is at the surface of palm worms.	Tmax=14.6 Tavg=9	Butterfield	
R669-HSF-1-0012	Zooarium	1798	302	05:28:19 Jul 31 2002	HFS RNA filter#1. Start 0528 Stop 0539. Logged Vol=1005ml. Sample probe position is at the surface of palm worms.	Tmax=18.2 Tavg=17.3 T2avg=12	Butterfield	
R669-SS-JJ3-0013	Zooarium	1799	122	06:04:49 Jul 31 2002	Suctioned white bacterial mat into jar#J3. Start 0606 Stop 0610. Start2 0612 Stop2 0614. Alien showing no temp anomaly.		Moyer	
R669-HFS-4-0014	Record Breaker	1802	228	06:56:33 Jul 31 2002	HFS gas piston#4 in gray smoker at top of ~13m chimney. Start 0658 Stop 0701. Start2 0738 Stop2 0742. Logged Vol=616ml. Weighted Vol=570ml. pH=4.25.	Tmax=312.2 Tavg=303.6	Butterfield	Evans
R669-GTB-5-0015	Record Breaker	1803	176	07:41:13 Jul 31 2002	Starboard gas tight bottle. Instant sample.		Evans	Butterfield/ Lilley
R669-HFS-23-0016	Record Breaker	1803	173	07:45:36 Jul 31 2002	HFS gas piston#23. Start 0745 Stop 0746. Logged Vol=145ml.	Tmax=312.2 Tavg=312.1 T2avg=100	Butterfield	Evans
R669-HFS-19-0017	Record Breaker	1803	175	07:48:41 Jul 31 2002	HFS bag#19 in gray smoker at top of ~13m chimney. Start 0748 Stop 0754. Logged Vol=507 ml. Weighted Vol=700ml. pH=3.91	Tmax=312 Tavg=311.1	Butterfield.	
R669-HFS-16-0018	Record Breaker	1803	169	07:59:54 Jul 31 2002	HFS bag#16 in gray smoker at top of ~13m chimney. Start 0759 Stop 0805. Logged Vol=600 ml. Weighted Vol=800ml.	Tmax=64.8 Tavg=58.7	Csotonyi	
R669-HFS-15-0019	Record Breaker	1803	172	08:07:14 Jul 31 2002	Filter sample 15 taken from the plume fluid 60 cm above orifice. Start 0806 Stop 0808. Tmax=64.6 Tavg=62.8 Vol=203 ml.		Butterfield	null

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R669-SF-0020	Record Breaker	1803	172	08:19:30 Jul 31 2002	Sulphide sample from top of chimney. Placing in purse. Digital pics taken.		Butterfield	Bolton/ Williams-Jones/ Leveille/ Cousens
R669-HFS-5-0021.	Lucky Find	1792	210	10:09:10 Jul 31 2002	Gas piston sample 5. Start 1008 Stop 1010. Tmax=102.54 Tavg=99.8 Vol=150 ml.		Butterfield	Evans
R669-HFS-20-0022	Lucky Find	1792	213	10:12:50 Jul 31 2002	Gas piston sample 20. Start 1012 Stop 1019 Tmax=130.8 Tavg=101 Vol=673 ml.		Butterfield	Evans
R669-HFS-22-0023	Lucky Find	1792	211	10:21:23 Jul 31 2002	Gas piston sample 22. Start 1021 Stop 1022 Tmax=105.9 Tavg=102.9 Vol=141 ml.		Butterfield	Evans
R669-SS-J8-0024	Lucky Find	1792	219	10:31:44 Jul 31 2002	Suction sample of sulphide worms into the flush jar. Start 1031 Stop 1035.		Lee	
R669-SS-J7-0025	Lucky Find	1792	179	10:41:43 Jul 31 2002	Suction sample of limpets into jar7. Start 1041 Stop 1043. Ambient temp 0.5 degrees.		Bates	
R669-HFS-6-0026	100m NE of Majestic	1733	189	11:08:33 Jul 31 2002	Taking HFS Sterivex filter #6 for background seawater. DNA sample. Pumped at about 50m off the bottom. Start 1108 Stop 1125. Tmax=2.5		Butterfield	Bolton
R669-net-port-0027	Majestic	1789	99	11:46:36 Jul 31 2002	Opening port larval net at 11:46. Closed at 12:16. Tow 1-2m above the structure and 5m above the bottom at 1 knot. Pore size is 180 microns.		Metaxas	
R669-net-stbd-0028	Majestic	1789	89	11:46:58 Jul 31 2002	Opening starboard larval net at 11:46. Closed at 12:16. Tow 1-2m above the structure and 5m above the bottom at 1 knot. Pore size is 63 microns.		Metaxas	
R669-HFS-24-0029	Majestic	1790	331	12:33:38 Jul 31 2002	Sampling gas piston HFS #24 at Majestic. Start 1233 Stop 1235. Tmax=305.8 Tavg=305.7 StDev=0.2 Vol=230mls.		Butterfield	Evans
R669-GTB-2-0030	Majestic	1790	326	12:37:33 Jul 31 2002	Firing port gas tight #2 at 12:37. Temp=306.		Evans	Butterfield/ Lilley
R669-HFS-18-0031	Majestic	1790	330	12:38:54 Jul 31 2002	Firing HFS bag #18 at Majestic. Start 1238 Stop 1244. Tmax=306.7 T1ave=306.4 StDev=0.15 Vol=588mls T2ave=67.		Butterfield	
R669-HFS-17-0032	Majestic	1790	326	12:46:03 Jul 31 2002	Firing HFS bag #17. Start 1245 Stop 1251. Tmax=307 T1ave=306.8 StDev=0.1 Vol=533mls T2ave=80.		Butterfield	
R669-SF-0033	Majestic	1790	315	13:01:20 Jul 31 2002	Top broken off of chimney. Breaking off sample from the base of Majestic. Into the purse. A second piece is taken at 13:14 and added to the purse. Took		Williams-Jones	
R669-SS-JJ4-0034	Majestic -Cactus Pear	1797	346	13:34:09 Jul 31 2002	Suction sample of bacterial mat into jar J4 in the majestic area ~8m west of fluid sampling site. Later named		Moyer	
R669-SS-J3-0035	Majestic - Cactus Pear	1796	86	14:03:02 Jul 31 2002	Suction sampling more bacterial mat into jar 3 at Cactus Pear in the Majestic area ~8m west of water		Moyer	

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R669-SF-0036	just east of Easter Island	1777	181	15:39:33 Jul 31 2002	Sulfide with tubeworms. Appears to be almost in the Easter Island area (one dead chimney over from EI). Will go in the portable biobox at Mkr-79.		Williams-Jones	
R669-RK-0037	near Easter Island	1789	30	16:32:26 Jul 31 2002	Piece of altered basalt taken from area on the periphery of Easter Island (~10m NW). The sample is going in the purse.		Gillis	
R670								
R670-net-port-0001	Zooarium	1792	157	00:49:31 Aug 01 2002	Plankton sampling. Net 1. Port side. 180 micron mesh. Start sample 1-2m above structure. 6-7m above bottom for tow. Open nets 0055. Closed and cinched nets at 0126.		Metaxas	
R670-net-stbd-0002	Zooarium	1793	110	00:59:23 Aug 01 2002	Plankton sampling. Net 2. Starboard side. 180 micron mesh. Start sample 1-2m above structure. 6-7m above bottom for tow. Open nets 0055. Closed and cinched nets at 0126.		Metaxas	
R670-MP-0003	Zooarium	1793	104	01:04:14 Aug 01 2002	Plankton sampling. McLane pump starboard side. 180 micron mesh. Start < 1 m above structure. Start pump at 0056. Close pump at 0126. Name of log file is Zooarium. Total volume 232 L.		Metaxas	
R670-MP-0004	Zooarium	1800	223	01:38:13 Aug 01 2002	Plankton sampling. McLane pump. port side. 180 microns. Start time 0137. Taken at the bottom of the structure. Pump stopped at 0219. Total volume pumped 404.1 liters. Log file name is Zooarium low.		Metaxas	
R670-SS-J1-0005	Zooarium	1800	223	01:39:44 Aug 01 2002	Suction sampling into jar1. Tubeworm bush - abundant limpets. Palm worms? Start sample at 0140. Stopped at 0148.		Juniper	Bates
R670-TWG-0006	Zooarium	1799	283	01:57:51 Aug 01 2002	Tubeworm grab to catalog biodiversity at Zoorarium. Almost 100% of worms have gill fins out. Port biobox. Very high density of particulates.		Tunnicliffe	
R670-SS-J2-0007	Limpet	1778	27	02:56:48 Aug 01 2002	Suction sampling limpets and sulphide worms into Jar2. High flux sample. Start 0300. Sample entry port clogged at 0306. Maximum ambient temperature 7C.		Bates	Lee
R670-SS-J3-0008	Limpet	1778	36	03:07:14 Aug 01 2002	Sampling limpets into Jar3 at a low flux site. Start 0312. Temperature that of ambient seawater. Stopped 0322.		Bates	
R670-BT-1-0009	Tubeworm	1780	352	03:50:21 Aug 01 2002	Reckoning bactrap#1 from relatively less flow at Mkr-73. Limpets have covered the bottom of the bactrap in three days. The bactrap was deployed on 7/28 R666.		Moyer	
R670-BT-3-0010	Tubeworm	1780	143	03:58:32 Aug 01 2002	Recovering bactrap#3 to stbd biobox from relatively high flow site. BT#3 was deployed on 7/28 on R666. Loaded with bacteria. Digital sit-cam image taken.		Moyer	
R670-SS-J8-0011	Tubeworm	1780	59	04:14:06 Aug 01 2002	Suctioning for gastropods in the tubeworm bush where BT#3 was positioned - for Ray Lee to keep alive (or not).		Lee	

Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R670-SS-J4-0012	Tubeworm	1779	301	04:25:12 Aug 01 2002	Suctioning blue material in J4. Start 0426 End 0427. The blue mat all pulled away in one clump and went up the hose. Moving to another patch. Start2 0428 End2 0429. Start3 0429 End3 0430. Good sample.		Moyer/ Chao	
R670-BT-2-0013	Einstein	1798	71	05:08:25 Aug 01 2002	Recovering bactrap#2 deployed on 7/28 R666 to the front of stbd biobox. BT#2 was positioned in relatively low flow.		Moyer	
R670-BT-4-0014.	Einstein	1796	71	05:18:07 Aug 01 2002	Recovering bactrap#4 which was deployed on 7/28 R666 to the stbd biobox. One replicate in the flow is loaded. Incredible sample. BT#4 is in		Moyer/ Chao	
R670-SS-J5-0015	Einstein	1797	0.8	06:27:41 Aug 01 2002	Start1 0632 Stop1 0635. Start2 0635 Stop2 0639. Alien Tmax1=11.5. Alien Tmax2=18. SS of white bacterial mat in flow at two sites in near proximity on the lower knob of Einstein.		Moyer	
R670-RK-0016	Einstein	1804	75	06:50:18 Aug 01 2002	Basalt sample placed in purse.		Gillis/ Channing	Cousens
R670-SS-J6-0017	Einstein	1804	67	07:10:15 Aug 01 2002	Suction sample of sulfidic sediment into jar#6. Start 0710 Stop 0713.		Leveille	
R670-SS-J7-0018	Einstein	1804	90	07:17:29 Aug 01 2002	Suction sample of sulfidic sediment. Start 0717 Stop 0718.		Leveille	
R671								
R671-MP-01-0001	above Ridge Top	1263	58	11:35:45 Aug 01 2002	McLane pump Port-side. 130.5 L pumped from 764m to 1270m depth. Average of ~7.5l/min. GFF filter.		Leveille	
R671-RK-0002	Easter Island	1780	31	12:59:21 Aug 01 2002	Broke off a piece at the top of a small extinct structure near Easter Island. Sampled piece appears to have a core of sulfide with a rim of oxide. Put in starboard biobox. Another piece added at 13:10.		Williams-Jones	
R671-RK-0003	Easter Island area	1777	260	13:51:54 Aug 01 2002	Spire from inactive chimney E of Easter Island. One spire broken in two pieces. Bottom has a very interesting orange core. Keeping the entire piece. Into port biobox.		Williams-Jones	
R671-RK-0004	Easter Island area	1777	251	14:05:02 Aug 01 2002	Another piece of the same chimney as from extinct chimney. Into rear stbd biobox. Good size piece. Looks like it may have sulfide and more of the interesting red substance in the center.		Williams-Jones	
R671-SS-JJ4-0005	Easter Island area	1777	241	14:37:17 Aug 01 2002	Suction sample of sediments into jar J4 approx. 10m SE of chimney samples (2-4) in the area near Easter Island. Start 1442 Stop 1451		Leveille	
R671-SS-JJ2-0009	Easter Island area	1778	302	14:57:05 Aug 01 2002	SS for sediments into jar J2 approx. 10 meters SE of chimney samples (2-04) in the area near Easter Island. Start 1454 Stop 1503.		Leveille	

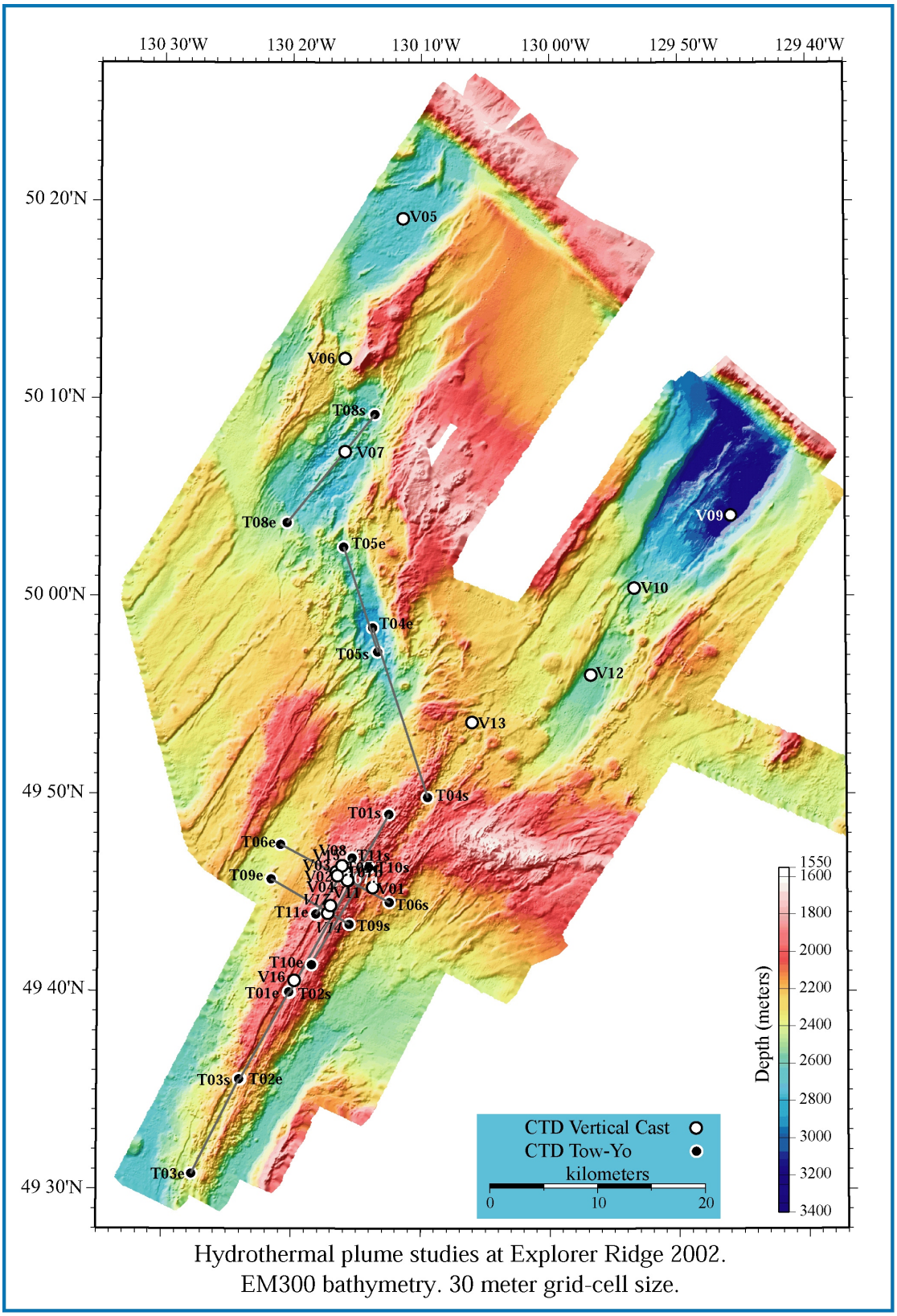
Sample	Location	Z	Hdg	Time	Description	Temp ©)	PI	SubSmps
R671-RK-0010	Ridge Top area	1785	216	15:42:33 Aug 01 2002	Edge of RidgeTop area. Highly altered basalt sample. Wedge shaped about 10 cm across and taken 1 m above the contact between the sulfide mound and the underlying contact. Put in the purse.		Gillis/ Channing	Williams-Jones
R671-RK-0011	Easter Island area	1777	58	15:58:17 Aug 01 2002	What looks like chalcopyrite from the base of a chimney. 4 pieces that are each about half fist size. They look shiny and gold. All into the purse. East of marker-79 about 9m.		Gillis/ Channing	Williams-Jones

ROPOS ROCK SAMPLES (LEG 2B)

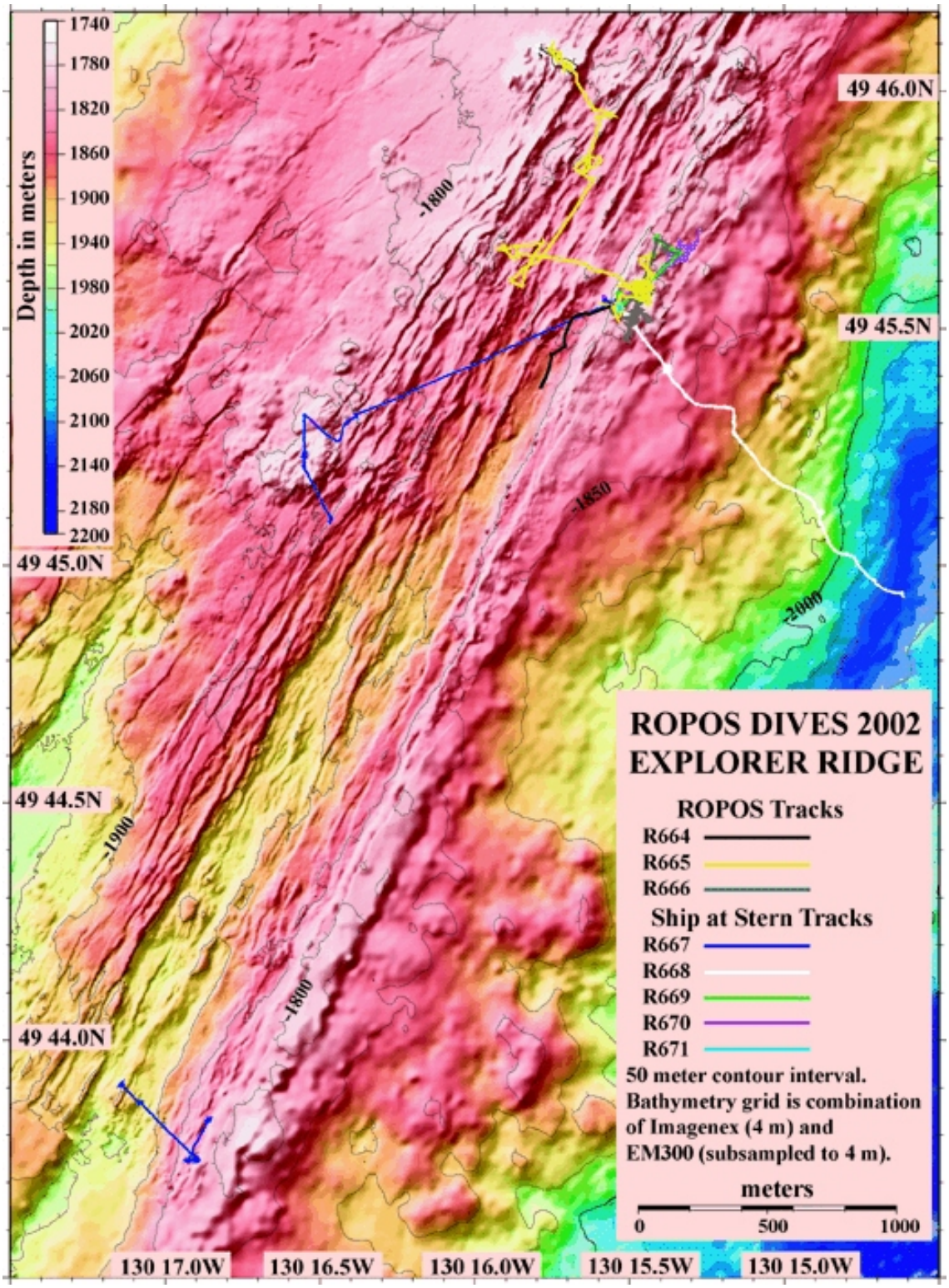
Sample	Area	Vent	Z	Rock Type	Shape etc.	Mineralogy	Description	PI
R665-RK-029	Central rift valley - nx to T9		1742	altered basalt	15x10x5 cm	Plagioclase - microphyric basalt.	Thick Mn-oxide coating; fine grained; plagioclase-phyric; medium grey; glassy rind preserved (few mm thick); 15% plag phenocrysts in glass.	CC/BC
R666-RK-011	Mystic Mound	Einstein - mound	1800	altered basalt	3 pieces; largest is 5x2x3 cm	Plagioclase - phyric basalt.	Vesicular basalt; light green outer rim, 1-2 mm thick; greenish-grey; vesicles lined with light green clay minerals with trace pyrite.	CC/BC
R668-RK-006	Mystic Mound	Ridgetop	1790	altered basalt	one piece, broken in 2; 16x16x10 cm	Quartz, clay mineral?, anhydrite	Dead tubeworms on outer surface; ground mass is quartz, with dark platey mineral (chlorite?); texture suggests brecciation. Outer rind of anhydrite. Highly silicified, brecciated with fragments of isolated pyrite and possibly fragments of basalt. There is a round cavity partially infilled with material similar to the ground mass. There are also highly irregular shaped pores partially or fully filled with anhydrite.	CC/BC
R670-RK-016	Mystic Mound	base of Einstein	1804	altered basalt	1 large piece broken into 2; 35x15x15 cm	fine grained, plag microlites	Large pillow fragment; surfaces coated with narrow light green outer zone, followed by a 1 cm thick Fe hydroxide zone; vesicules are open; looks highly porous - looks highly altered	CC/BC
R667-RK-01	Central Seamount		1780	basalt		plag - phyric basalt	Mn oxide covered; plag phyric, 15% plag; 1-2 mm ave., up to 4 mm; medium grey matrix very fine grained; vesicles 2-5%, <1 mm. Glassy rind.	BC/CC
R668-RK-05	Mystic Mound	Ridgetop	1793	basalt	10x8x6 cm		Mn oxide covered basalt; one surface is evident: vesicular, greenish colour suggests chloritization	BC/CC
R666-RK-012	Mystic Mound	Einstein - mound	1798	sulfide	2 pieces; largest is 12x6x8 cm	Barite, anhydrite, sphalerite?	Zoned sample: outer zone is anhydrite (1–6 cm thick); inner core is barite with minor sphalerite? (1-6 cm). Mn coated with minor oxidation between anhydrite and Mn oxides.	WJ/RL/BC
R669-RK-037	Mystic Mound	SE of Ridgetop in basalt	1789	sulfide	20x16x4cm	pyrite with minor barite	Mn coating (~1mm) followed by Fe-oxide crust (few mm), crossed by hematite vein. Core is composed of 95% pyrite (localized patches of sphalerite), with layer of barite.	WJ/RL/BC
R671-RK-010	Mystic Mound	RidgeToP - near easter island	1785	sulfide	10x8x6 cm		Highly weatehrered outer surface with cuprite, Fe hydroxides, and maybe adacamite; clear colorless needles and plates of anhydrite on surfaces; interior is massive pyrite	WJ/RL/BC
R668-RK-001	Mystic Mound	Ridgetop	1847	sulfide	numerous broken pieces and mud; size up to 20x20x10 cm	Ferric hydroxides and clay (nontronite?)	Minor Mn coat on exterior surface; interior is zoned: next to rim is orange to yellow (1.5 cm thick), sharp change to chocolate brown band (3 mm thick), sharp change to green core. Density less than pumice. Orange yellow zone has a fine ripple pattern, scale <1 mm. Numerous pores, sub mm diameter, square to round shape. No relict textures/minerals. Note that zonation evident in hand sample was also evident in outcrop. Within the orange yellow zone porosity is controlled by a widely spaced sheet-like trellis. Porosity is dominantly in orange yellow zone - micron scale pores due to extreme alteration. (1 half of large bag was frozen; 1 half was refrigerated at 4˚C)	WJ/RL/BC

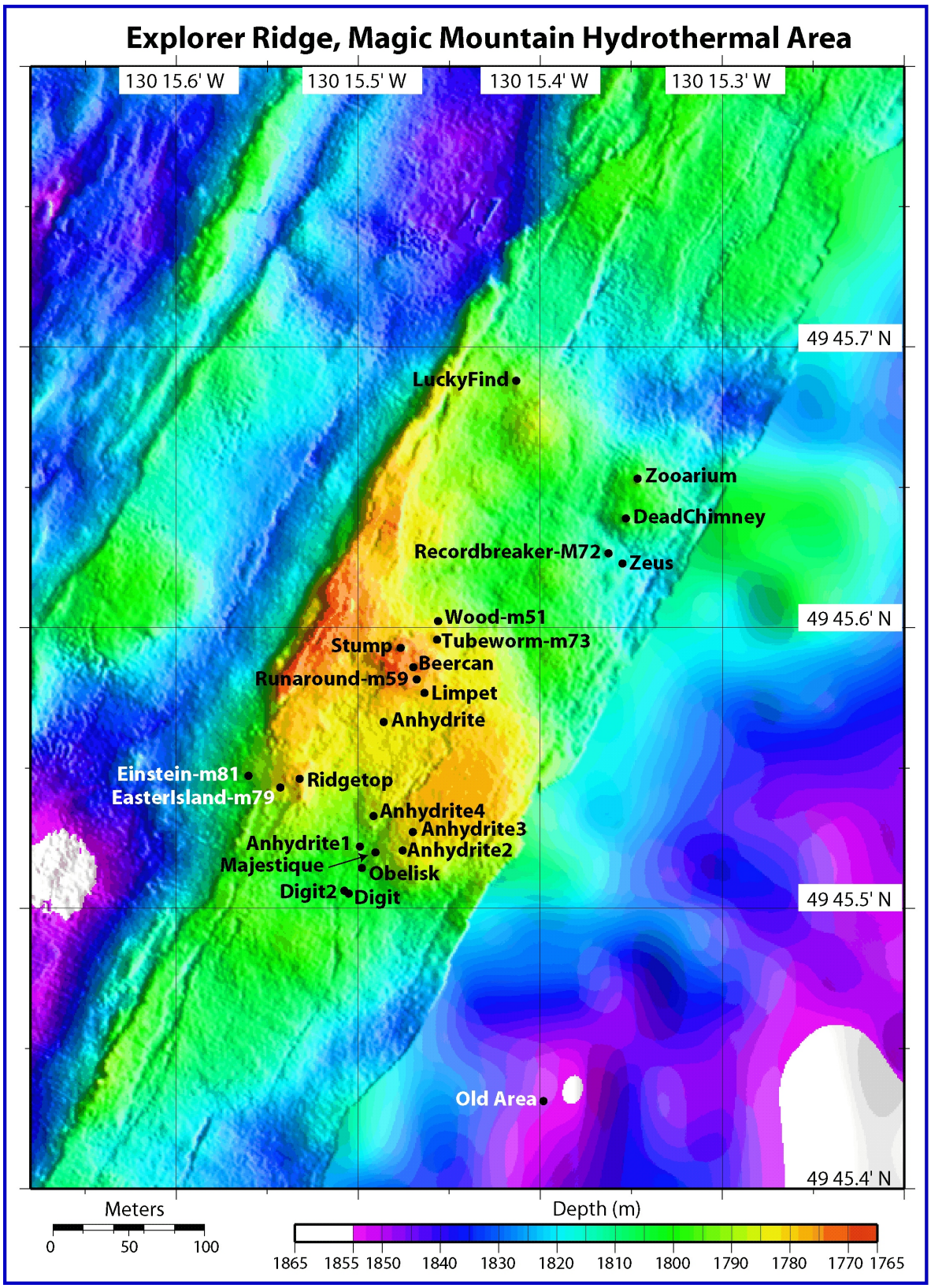
Sample	Area	Vent	Z	Rock Type	Shape etc.	Mineralogy	Description	PI
R668-RK-007	Ochre Garden		1878	sulfide	2 large pieces, largest is 12x10x6 cm; small bag of broken bits	Clay minerals?, crytocrystalline silica?	Color ranges from green to white. Extremely porous; density of light pumice. Composed of white chalky substance; planar, sheet texture - clay mineral?; replacement texture - papery look. Tube casts.	WJ/RL/BC
R668-RK-008	Ochre Garden		1880	sulfide	2 pieces; largest is 8x4x3 cm		Color - dark grey to black; local white patches on surface. One surface small patch (2x2 cm) of oxidation, surrounded with yellow zone, also has small gastropods on surface - interpretation: this was outer surface of sample.	WJ/RL/BC
R669-SF-020	Record Breaker	top of chimney	1803	sulfide	10x6x4 cm; one piece	80% sphalerite > pyrite > barite > anhydrite	Interior: very fine grained sphalerite (looks like low Fe sphalerite); bladed grey crystals of barite mixed spalerite; anhydrite is restricted to surface; fair amount of pyrite mixed with sphalerite; zones with pale brown sphalerite. Color - dark grey to black; local white patches on surface. One surface small patch (2x2 cm) of oxidation, surrounded with yellow zone, also has small gastropods on surface - interpretation: this was outer surface of sample.	WJ/RL/BC
R669-SF-033	Majestic	base of chimney	1790	sulfide	3 pieces; largest is 5x5x5 cm	barite + anhydrite + wurtzite + pyrite; anhydrite is late; wurtzite > pyrite	Dense; grey to white surfaces (barite and anhydrite); patches of wurtzite(? - could be sphalerite). Blades of wurtzite are growing on surface (at right angles), hexagonal plates; anhydrite is partially cemented to wurtzite. Irregular distribution of minerals. Abundant pyrite, mixed locally with wurtzite; small cavity filled with anhydrite. Low-Fe wurtzite, hexagonal plates, are stacked, translucent. Barite is intermixed with sulfides. Anhydrite is the latest void-filling phase.	WJ/RL/BC
R669-SF-036	Mystic Mound	Ridgetop - 1 dead chimney over from Easter Island	1777	sulfide	4 pieces; largest is 4x4x4 cm	pyrite > sphalerite + barite > anhydrite	Thin film of Mn-coat except on broken surfaces; dominantly pyrite that has been extensively dissolved; anhydrite fills cavities, coats surfaces. Spahlerite >10% mixed with barite; pyrite is dominant sulphide. Minor oxidation on surface. Tube worm mold/pseudomorph.	WJ/RL/BC
R671-RK-002	Mystic Mound	RidgeToP - top of small extinct structure	1780	sulfide	3 large pieces, largest 8x4x6 cm; several smaller pieces	barite >> sphalerite, late anhydrite	Outer surface coated with Mn oxides. Fe-stained anhydrite lines cavities. Dominantly barite with pyrite and minor sphalerite .	WJ/RL/BC
R671-RK-003	Mystic Mound	RidgeTop - spire of inactive chimney east of Easter Island	1777	sulfide	2 large spires that fit together (total length 50 cm)	barite >> pyrite; minor anhydrite	Mn coated outer surface. Tubular structures rimmed with anhydrite, infilled with barite and pyrite. Anhydrite is late; lines outer surface surface of sulphide, between sulphide and Mn oxides. Late cavities (almost tubes) lined with anhydrite, looks as if anhydrite is being dissolved; Anhydrite is Fe-hydroxide covered. .	WJ/RL/BC

Sample	Area	Vent	Z	Rock Type	Shape etc.	Mineralogy	Description	PI
R671-RK-004	Mystic Mound	RidgeToP - spire of inactive chimney east of Easter Island. same chimney as 003	1777	sulfide	I large piece; 32x12x12 cm	pyrite > chalcopyrite, barite, anhydrite	Outer surface coated with Mn oxides (<1 mm thick). Next is 2 mm thick oxidized zone. Massive sulphide, pyrite dominated. First tube is elliptical (1 cm in diameter; aspect ratio 2:1). Second larger orifice is lined with (2-3 cm in diameter). Oxidized rim in sharp contact with very fine grained pyrite; pyrite is very porous, porosity is locally infilled with anhydrite; pores are < 1 mm in diameter. First tube: lined with very fine grained pyrite, tube is composed of an outer zone of chalcopyrite, inner zone of barite and sphalerite. Sequence is chalcopyrite to barite to Fe-rich sphalerite (outer-inner sequence). Second tube: pyrite to chalcopyrite to barite to anhydrite fill coated with Fe-hydroxides and displays dissolution textures. Locally on one side pyrite (no chalcopyrite or barite) to anhydrite. After anhydrite dissolution, Fe hydroxides ppt (light brown to orange). In a marginal area next to second tube, sequence is: pyrite to chalcopyrite to sphalerite (dark).	WJ/RL/BC
R671-RK-011	Mystic Mound	RidgeTop - from base of chimney	1777	sulfide	3 larger pieces, 2x3x6 cm; several cm-sized pieces.	chalcopyrite, spaherite, barite, pyrite	Beautiful rock! Paragenesis: chalcopyrite/pyrite mix to sphalerite to barite. Pyrite is intergrown with chalcopyrite. Chalcopyrite patches in a sea of pyrite. No outer surface is obvious.	WJ/RL/BC; Bob had one small piece
R666-SF-013	Mystic Mound	Cleopatra	1775	sulfide	numerous small fragile pieces; bag of mud	barite, Fe-poor sphalerite, trace anhydrite (was originally 90% anhydrite)	Pieces represent residues of chimney that was originally dominantly anhydrite, washed out near surface	WJ/RL/BC
R664-SF-001	near Ochre Garden		1850	sulfide	20x15x7 cm, 1 piece	pyrite, anhydrite, hematite	Outer surface coated with Mn oxides (~1 mm thick). Outside Massive sulphide core is composed of limonite boxwork, then 1cm thick zone of anhydrite (crystals on outer part coated with limonite/hematite) fine crystals grading into larger crystals over last 1-2mm. Then botryoidal hematite? layer (~ 4cm thick). Then fine grained crystalline pyrite (~5mm thick). Then core dominated by variably dissolved pyrite (~10 cm diameter).	WJ/RL/BC



Hydrothermal plume studies at Explorer Ridge 2002.
EM300 bathymetry. 30 meter grid-cell size.


Depth in meters
1740
1780
1820
1860
1900
1940
1980
2020
2060
2100
2140
2180
2200
49 46.0N
49 45.5N
49 45.0N
49 44.5N
49 44.0N
-1800
-1850
-2000
-1900
-1800
ROPOS DIVES 2002
EXPLORER RIDGE
ROPOS Tracks
R664
R665
R666
Ship at Stern Tracks
R667
R668
R669
R670
R671
50 meter contour interval.
Bathymetry grid is combination
of Imagenex (4 m) and
EM300 (subsampled to 4 m).
meters
0
500
1000
130 17.0W
130 16.5W
130 16.0W
130 15.5W
130 15.0W


Explorer Ridge, Magic Mountain Hydrothermal Area
130 15.6' W
130 15.5' W
130 15.4' W
130 15.3' W
49 45.7' N
49 45.6' N
49 45.5' N
49 45.4' N
LuckyFind
Zooarium
DeadChimney
Recordbreaker-M72
Zeus
Wood-m51
Tubeworm-m73
Stump
Beercan
Runaround-m59
Limpet
Anhydrite
Einstein-m81
EasterIsland-m79
Ridgetop
Anhydrite4
Anhydrite3
Anhydrite1
Anhydrite2
Majestique
Obelisk
Digit2
Digit
Old Area
Meters
0
50
100
Depth (m)
1865 1855 1850 1840 1830 1820 1810 1800 1790 1780 1770 1765