Submarine Ring of Fire 2014 - Ironman Cruise Report

R/V Roger Revelle Cruise RR1413
November 29 – December 21, 2014
Guam – Guam
JASON Dives J2-797 – J2-801

Chief Scientists: Craig Moyer and William Chadwick
R/V Revelle Captain: Tom Desjardins
JASON Expedition Leader: Tito Collasius

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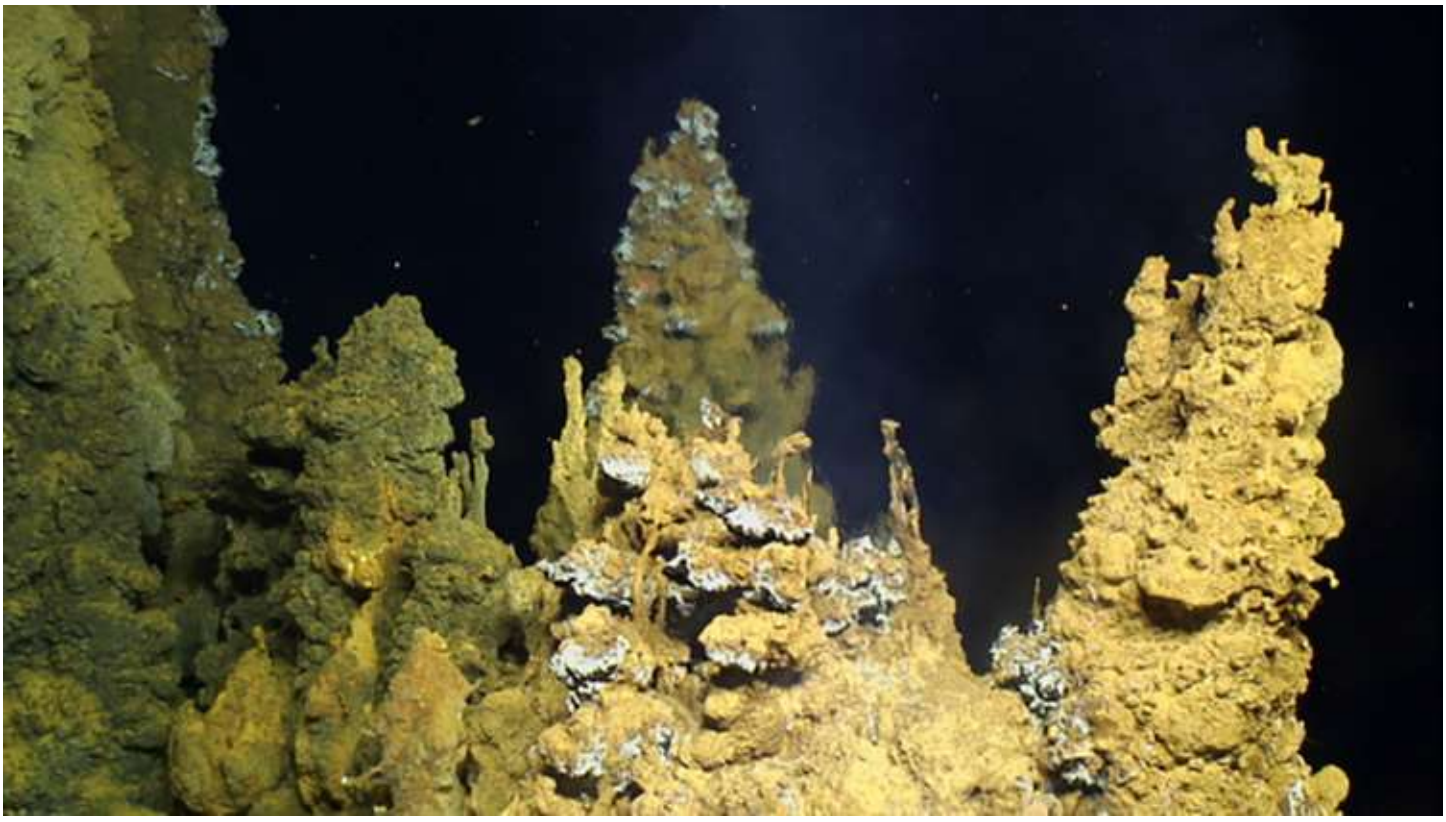

Sulfide chimneys coated with iron-based microbial mat at the Urashima vent site.

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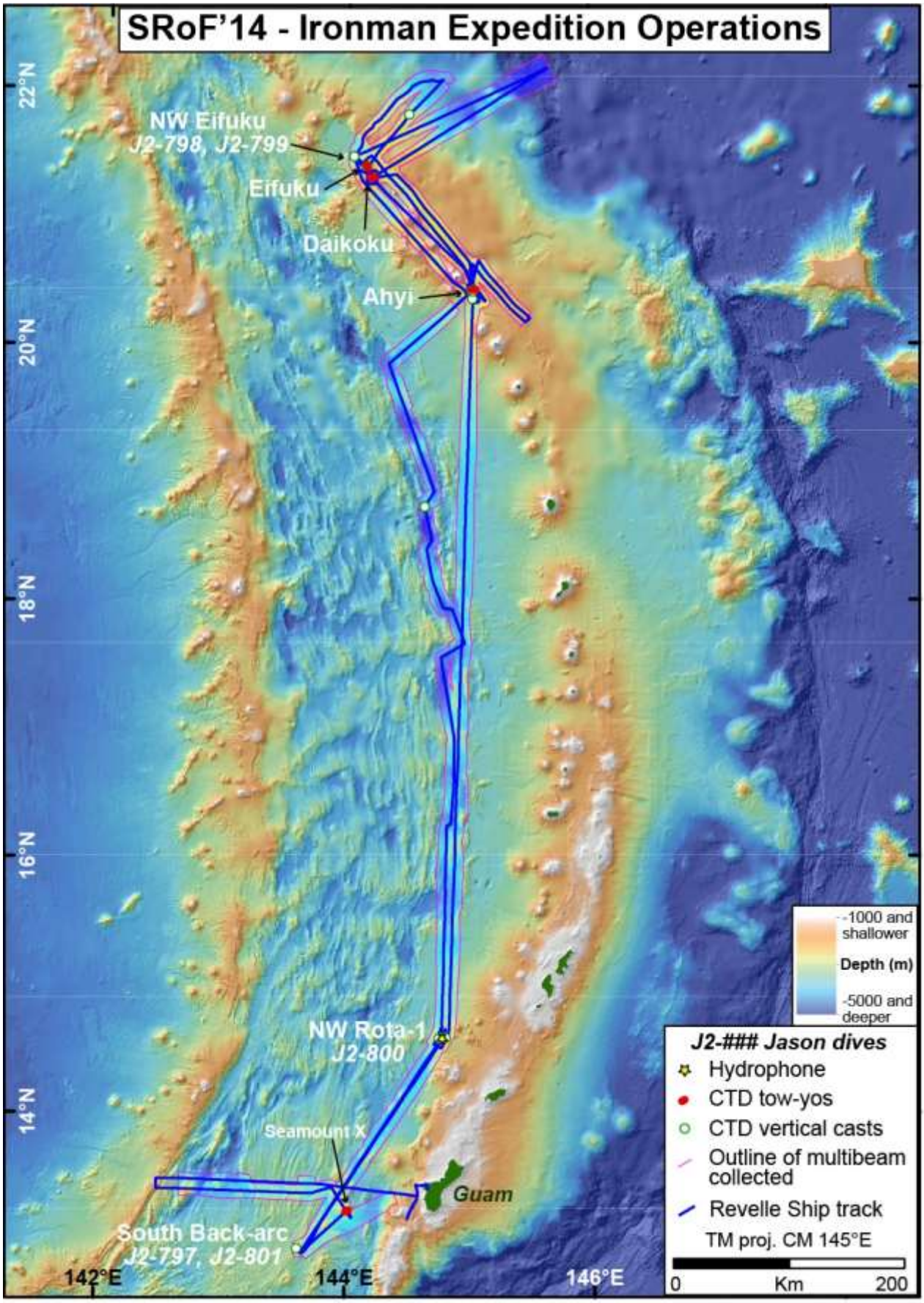

SRoF'14 - Ironman Expedition Operations
NW Eifuku
J2-798, J2-799
Eifuku
Daikoku
Ahyi
NW Rota-1
J2-800
Seamount X
Guam
South Back-arc
J2-797, J2-801
22°N
20°N
18°N
16°N
14°N
142°E
144°E
146°E
-1000 and shallower
Depth (m)
-5000 and deeper
J2-### Jason dives
Hydrophone
CTD tow-yos
CTD vertical casts
Outline of multibeam collected
Revelle Ship track
TM proj. CM 145°E
0
Km
200

1 - SRoF2014 - Ironman Cruise Summary

Bill Chadwick and Craig Moyer, Co-Chief Scientists

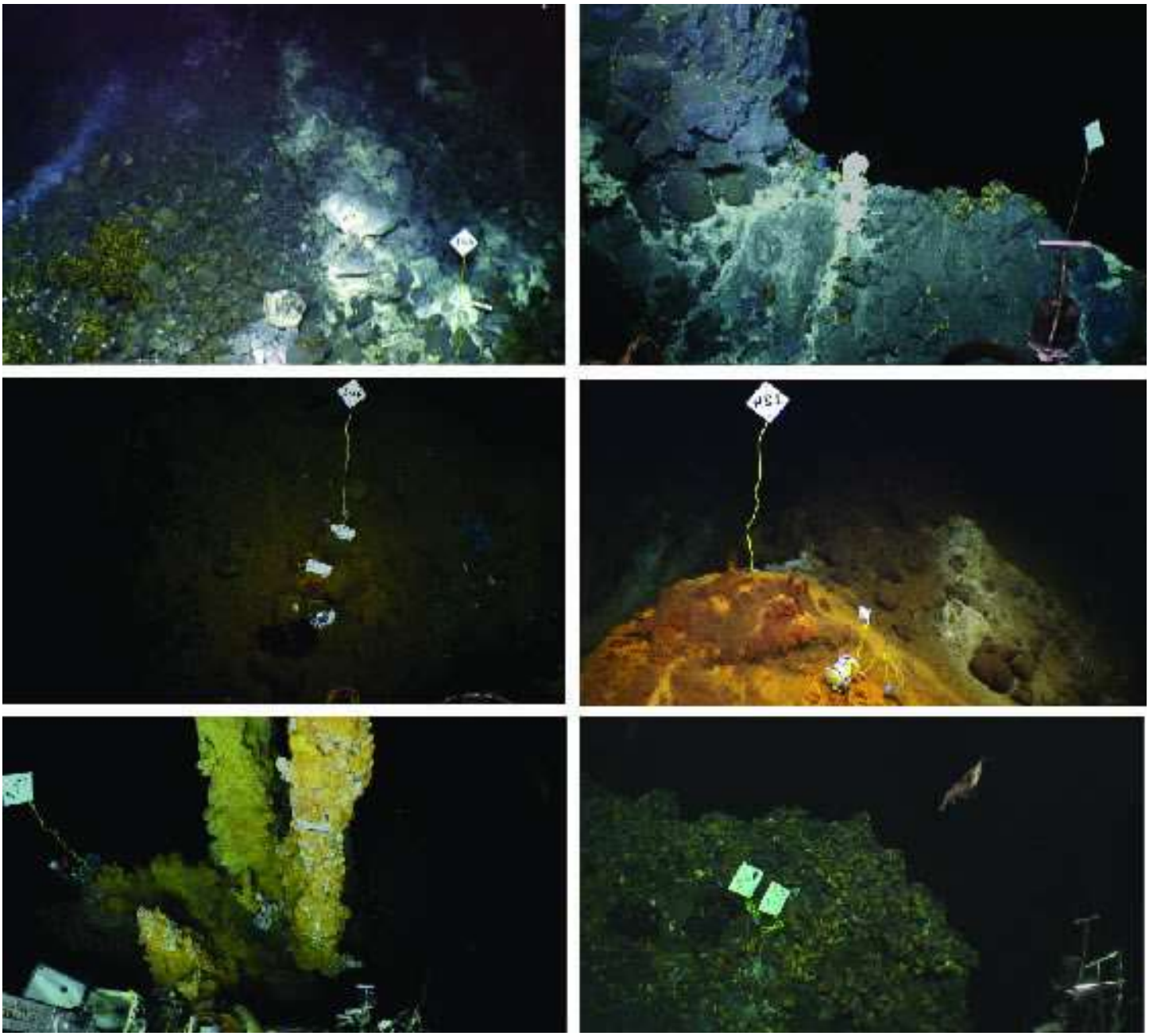
The “Submarine Ring of Fire 2014 – Ironman” Expedition was a cooperative venture with two science parties with overlapping interests and goals. Craig Moyer from Western Washington University led a group funded by the National Science Foundation to conduct research on iron-oxidizing bacteria at hydrothermal vents. Bill Chadwick led a NOAA/PMEL group funded by the NOAA Ocean Exploration and Research Program and focused on the chemical and biological impacts of hydrothermal vent emissions from active submarine volcanoes in the Mariana arc.

The NSF-funded group was a predominately microbiological team from Western Washington University, Bigelow Marine Labs, and University of Delaware with a focus on the better understanding the ecology and evolution of hydrothermal microbial mat systems driven by a novel class of microbes called *Zetaproteobacteria,* which have been determined to function as ecosystem engineers. The objectives that were met during the expedition include: (1) The fine-scale collection of microbial mat samples using the BioMat Syringe or BMS sampler. These samples will be used for DNA and RNA molecular microbiological analyses. The sites that we were able to collect samples from were the orange/yellow iron-type mats found at Snail, Urashima, NW Rota-1, and NW Eifuku vent sites, as well as a few from the white or sulfur-type mats found also at NW Rota-1 and NW Eifuku Seamounts. (2) General microbial mat sample collections for archival purposes. This includes using our combined team-standardized methods for (i) flash freezing in glycerol and storage at -80°C for downstream enrichment culturing, (ii) maintaining at -20°C in glutaraldehyde for SEM, which allows for mat morphology analysis and (iii) maintaining at 4°C in paraformaldehyde for FISH microscopy investigations. Individual participants had the option of selecting additional subsamples for their own specific analyses when appropriate, but one complete set of microbial samples using our standardized techniques was collected by the group for use by all participants. (3) Seafloor photo-mosaic mapping using the new lighting and camera systems available on ROV Jason II at both Snail and Urashima Vent areas. (4) The combined microbial sampling along with mapping, fluid chemistry and geological sampling was invaluable allowing for a much greater understanding of the microbial communities in terms of geochemical and geophysical parameters.

The PMEL objectives that were met during the expedition include: (1) We collected ship-based multibeam sonar bathymetric data in the Mariana arc and back-arc to expand pre-existing coverage (which was especially poor in the back-arc). The R/V Revelle’s EM122 system (12 kHz) is particularly suited to surveying in the back-arc where depths extend down to 4000-5000 m. The new data will be valuable in planning and executing future exploration and research in the Mariana region. (2) In addition, we re-surveyed the bathymetry around Ahyi Seamount, which erupted in April-May 2014. The re-survey showed major depth changes at the summit and on the flanks of the seamount due to the eruption. CTD casts and tows discovered that Ahyi now has a robust hydrothermal system that did not exist before. (3) We also collected high-resolution multibeam bathymetry at NW Eifuku Seamount with the Jason ROV to better define the physical environment on the seafloor and put the ROV observations in context. Unfortunately, this survey was only partially completed due to limited dive time. (4) In addition, we collected water-column acoustic reflectivity data with Revelle’s EM122 sonar system to image CO_2 bubble plumes over the summits of several seamounts. No bubble plumes were observed over NW Rota-1 Seamount (which had previously produced robust bubble plumes in 2010) because its eruptive activity was in hiatus. However, CO_2 bubble plumes were imaged for the first time over NW Eifuku, Ahyi, and Daikoku Seamounts. (5) Geologic, chemical, and biological samples were collected during five Jason ROV dives at three dive sites: Snail and Urashima vents in the southern Mariana back-arc (focused on iron-oxidizing bacteria), NW Eifuku Seamount (focused on how mussels have adapted to a highly acidic environment), and NW Rota-1 Seamount (focused on how the chemosynthetic ecosystem responds to the waxing and waning of volcanic activity). In addition, high-resolution imagery (both still images and HD video) was collected to document the physical environment on the seafloor and where samples were taken. Coordinated chemical and biological sampling at all three dive sites will be used to better understand the links between environment and the health, diversity, and populations of chemosynthetic biological communities at each site. (6) CTD casts and tows were collected between ROV dives at multiple seamounts to document the hydrothermal output from each site. These water-column data revealed that significant changes had occurred at multiple sites over the last decade, including newly rejuvenated hydrothermal systems at Ahyi and Eifuku Seamounts, the discovery that eruptive activity at NW Rota-1 had stopped, but Daikoku Seamount was discovered to be in eruption for the first time (based on high levels of dissolved hydrogen). Overall, these observations suggest that the Mariana Arc seamounts are much more dynamic and active than had been previously thought. (7) One of our objectives was to compare several independent measures of CO_2 output at NW Rota-1 Seamount, including the imaging of bubble plumes with multibeam water-column data, the recording of eruptive output with an in-situ hydrophone, the analysis of water-column chemistry via CTD casts and tows, and visual observations on the seafloor. Because NW Rota-1 was found to be in an eruptive hiatus during our expedition, we were not able to collect new data to accomplish this task. However, we may be able to make some of these comparisons with data that was collected at other sites or in other years.

For both groups, some of our initial objectives during the cruise could not be met due to limited Jason ROV dive time caused by problems with inclement weather (high winds and seas) and problems that developed during the cruise with the fiber-optic cable being used with Jason. Seven days were lost due to weather and another four days were lost due to problems with the Jason cable. Despite these problems, we were able to accomplish many of our cruise objectives.

We are grateful to the funding agencies that supported our exploration and research, and we greatly appreciate the support from the Scripps Institution of Oceanography, the captain and crew of R/V Revelle, the Woods Hole Oceanographic Institution, the National Deep Submergence Facility, and the Jason ROV team. Thanks to all for making this cruise a success.



Markers deployed on this expedition: (top-bottom; left-right) Mkr-144 NW Eifuku: Champagne; Mkr-145 NW Eifuku: Razorback; Mkr-146 NW Eifuku: Upper YellowCone; Mkr-124 NW Eifuku: Lower YellowCone; Mkr-125 Urashima: Ultra-no-chichi; Mkrs 123/140 NW Eifuku near Mkr-145. (See section 5.4 for marker deployment information).

2 - Operations Log

Red-Jason ops; Blue-CTD ops; Purple-Multibeam ops; Orange-Hydrophone ops; Green-Plankton Net						
UTC is 10 hours behind local Guam time						
UTC date	**UTC time**	**Guam date**	**Guam time**	**Event Log - SRoF-14 - Ironman Expedition**	**latitude (N)**	**longitude (E)**
2014 - 11 - 28	22:00	11-29	08:00	Depart Guam	13-25.242N	144-39.950E
2014 - 11 - 29	04:15	11-29	14:15	On site at Snail Vent (S. back-arc)	12-57.234N	143-37.008E
2014 - 11 - 29	04:40	11-29	14:40	USBL Pole lowered	12-57.273N	143-37.057E
2014 - 11 - 29	04:22	11-29	14:22	XBT-001	12-57.258N	143-37.026E
2014 - 11 - 29	05:15	11-29	15:15	USBL Elevator deployed	12-57.180N	143-37.123E
2014 - 11 - 29	10:30	11-29	20:30	USBL calibration completed		
2014 - 11 - 29	13:39	11-29	23:39	V14B-test CTD Deployed (to ~600m)	12-57.070N	143-37.125E
2014 - 11 - 29	14:11	11-30	00:11	CTD on deck	12-57.109N	143-37.074E
				13-hour delay due to CTD wire fraying and ROV manipulator/hydraulic line problems.		
2014 - 11 - 30	03:18	11-30	13:18	Begin Jason Dive J2-797 (Snail/Urashima sites; S Back-arc)	12-57.117N	143-37.085E
2014 - 11 - 30	03:21	11-30	13:21	Medea deployed	12-57.118N	143-37.085E
2014 - 11 - 30	20:25	12-1	06:25	Elevator recovery hook up	12-56.975N	143-36.901E
2014 - 11 - 30	20:36	12-1	06:36	Elevator on deck	12-56.887N	143-36.871E
2014 - 12 - 1	14:07	12-2	00:07	Medea on deck	12-55.338N	143-39.872E
2014 - 12 - 1	14:16	12-2	00:16	Jason on deck, End Dive J2-797	12-55.337N	143-39.948E
2014 - 12 - 1	14:35	12-2	00:35	XBT-002	14-24.925N	144-40.037E
2014 - 12 - 1	14:47	12-2	00:47	USBL Pole raised	12-55.755N	143-40.517E
2014 - 12 - 1	14:55	12-2	00:55	Start multibeam data logging during transit from Snail to NW Rota-1. (MB line 0049)	12-56.574N	143-41.352E
				Arrive NW Rota-1. Decide making a Jason dive is not possible due to Typhoon passing south of Guam and limited time before weather worsens here. Will have to head north next.		
2014 - 12 - 2	01:12	12-2	11:12	Multibeam re-survey NW Rota-1 south to north over summit. SOL 49.		
2014 - 12 - 2	02:17	12-2	12:17	Multibeam EOL 51. End of bathy survey over summit.		
2014 - 12 - 2	02:46	12-2	12:46	Water column line over NW Rota summit. SOL 54		
2014 - 12 - 2	04:46	12-2	14:46	Water column survey complete. EOL 60		
2014 - 12 - 2	05:00	12-2	15:00	USBL Pole lowered		
2014 - 12 - 2	05:00	12-2	15:00	Transponder is on the CTD rosette for tracking.	14-36.043N	144-46.446E
2014 - 12 - 2	05:34	12-2	15:32	CTD V14B-01 deployed (NW Rota1)	14-36.040N	144-46.465E
2014 - 12 - 2	06:27	12-2	16:28	CTD V14B-01 on deck	14-36.040N	144-46.479E
2014 - 12 - 2	07:50	12-2	17:50	Begin launch of hydrophone mooring at NW Rota-1.		
2014 - 12 - 2	09:33	12-2	19:33	Mooring anchor deployed E2014	14-36.149N	144-46.324E
2014 - 12 - 2	10:29	12-2	20:29	CTD V14B-02 Deployed (NW Rota1)	14-35.820N	144-45.429E
2014 - 12 - 2	10:53	12-2	20:53	CTD Max Depth 1200m	14-35.826N	144-45.394E
2014 - 12 - 2	11:41	12-2	21:41	CTD on Deck	14-35.831N	144-45.393E
2014 - 12 - 2	12:02	12-2	22:02	Begin multibeam survey of NW Rota1 (SOL 61). Official start of survey line 62.		

Red-Jason ops; Blue-CTD ops; Purple-Multibeam ops; Orange-Hydrophone ops; Green-Plankton Net						
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2014 - 12 - 2	15:03	12-3	01:03	End NW Rota 1; begin transit/survey to Ahyi		
2014 - 12 - 3	20:11	12-4	06:11	End multibeam logging of transit from Rota to Ahyi at increased speed (12 kts).		
2014 - 12 - 3	20:15	12-4	06:15	XBT-003	20-27.001N	145-01.185E
2014 - 12 - 3	20:36	12-4	06:36	CTD V14B-03 deployed (Ahyi)	20-26.744N	145-01.755E
2014 - 12 - 3	21:10	12-4	07:10	CTD V14B-03 Max Depth 500m	20-26.742N	145-01.765E
2014 - 12 - 4	21:33	12-4	07:33	CTD V14B-03 on deck	20-26.742N	145-01.768E
2014 - 12 - 3	21:48	12-4	07:48	Begin multibeam logging at Ahyi (SOL 128).	20-26.893N	145-01.713E
				WCD line 136 see strong anomaly near Ahyi summit		
2014 - 12 - 4	00:58	12-4	10:58	End multibeam and water column logging (EOL 138).	20-26.160N	145-01.860E
2014 - 12 - 4	01:11	12-4	11:11	CTD V14B-04 Deployed (Ahyi)	20-26.163N	145-01.847E
2014 - 12 - 4	01:20	12-4	11:20	CTD Max Depth 200m	20-26.162N	145-01.848E
2014 - 12 - 4	01:35	12-4	11:35	CTD On Deck	20-26.161N	145-01.849E
2014 - 12 - 4	02:32	12-4	12:32	CTD V14B-05 deployed (Ahyi)	20-26.374N	145-01.763E
2014 - 12 - 4	02:40	12-4	12:40	CTD V14B-05 @190m	20-26.378N	145-01.762E
2014 - 12 - 4	03:08	12-4	13:08	CTD V14B-05 on deck	20-26.375N	145-01.765E
2014 - 12 - 4	03:12	12-4	13:12	Begin EM122 water column survey (SOL 143).		
2014 - 12 - 4	04:43	12-4	14:43	End EM122 water column (EOL 147). Continue logging EM122 bathymetry at Ahyi.		
2014 - 12 - 4	04:57	12-4	14:57	End EM122 multibeam logging (EOL 150).		
2014 - 12 - 4	05:20	12-4	15:20	CTD T14B-01 deployed (Ahyi)	20-27.006N	145-00.948E
2014 - 12 - 4	05:22	12-4	15:22	Tow CTD on deck	20-27.006N	145-00.947E
2014 - 12 - 4	05:25	12-4	15:25	Tow CTD redeployed	20-27.004N	145-00.945E
2014 - 12 - 4	08:31	12-4	18:31	CTD T14B-01 on deck	20-27.010N	145-03.217E
2014 - 12 - 4	09:22	12-4	19:22	Begin multibeam logging at Ahyi to continue bathy survey (SOL 154).		
2014 - 12 - 4	11:53	12-4	21:53	Continue multibeam logging on transit from Ahyi to NW Eifuku (full speed 12 kts) (SOL 160)		
2014 - 12 - 4	19:15	12-5	05:15	Arrived at NW Eifuku		
2014 - 12 - 4	19:23	12-5	05:23	End multibeam logging (NW Eifuku) (EOL 176)		
2014 - 12 - 4	21:52	12-5	07:52	Elevator Deployed	21-29.239N	144-02.546E
2014 - 12 - 4	22:30	12-5	08:30	Begin Jason J2-798 (NW Eifuku)	21-29.239N	144-02.544E
2014 - 12 - 4	22:38	12-5	08:38	Medea Deployed	21-29.238N	144-02.546E
2014 - 12 - 5	23:18	12-6	09:18	Elevator Off Bottom	21-29.256N	144-02.545E
2014 - 12 - 6	00:00	12-6	10:00	Elevator On Surface	21-29.144N	144-02.490E
2014 - 12 - 6	00:18	12-6	10:18	Elevator On Deck	21-29.323N	144-02.701E
2014 - 12 - 6	08:21	12-6	18:21	Medea on deck (Jason recovery aborted)	22-04.883N	144-46.688E
2014 - 12 - 6	08:50	12-6	18:50	Medea redeployed after failure to recover Jason. Medea and Jason lowered to 800 m.		
2014 - 12 - 6	11:27	12-6	21:27	Logging multibeam while towing Jason/Medea (Lines 177 - 306) at 1 knot toward NE.		
				It took 3 days for the weather to improve enough to recover Jason and Medea - and no science ops were possible except multibeam.		
2014 - 12 - 9	02:15	12-9	12:15	Reeling in cable to bring Medea aboard. Discovered cable badly damaged at ~250 m w/o. Subsequently not able to dive for 4 days		

Red-Jason ops; Blue-CTD ops; Purple-Multibeam ops; Orange-Hydrophone ops; Green-Plankton Net						
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				while cable is cut, inspected, and tested.		
2014 - 12 - 9	04:40	12-9	14:40	Jason on deck. Ship's location is over trench after towing to NE for 3 days.	22-04.079N	144-45.564E
2014 - 12 - 9	05:00	12-9	15:00	XBT 005	20-02.872N	144-44.334E
2014 - 12 - 9	06:35	12-9	16:35	Stopped multibeam logging (EOL 306).	21-49.000N	144-30.000E
2014 - 12 - 9	06:58	12-9	16:58	CTD V14B-06 deployed (background)	21-49.011N	144-30.034E
2014 - 12 - 9	07:54	12-9	17:54	CTD at 3050m	21-49.018N	144-29.993E
2014 - 12 - 9	09:32	12-9	19:32	CTD V14B-06 on deck.		
2014 - 12 - 9	10:12	12-9	20:12	Begin multibeam logging while transiting back to Eifuku from the trench (SOL 312).		
2014 - 12 - 9	12:15	12-9	22:15	XBT 007	21-26.837N	144-11.110E
2014 - 12 - 9	12:33	12-9	22:33	End multibeam logging (EOL 318).		
2014 - 12 - 9	13:33	12-9	23:33	CTD T14B-02 Deployed (Eifuku)	21-24.070N	144-09.098E
2014 - 12 - 9	15:36	12-10	01:36	CTD tow on deck	21-25.414N	144-08.419E
2014 - 12 - 9	15:40	12-10	01:40	Begin multibeam logging along east edge of existing MB coverage heading S to Ahyi.		
2014 - 12 - 10	01:52	12-10	11:52	XBT 008	20-33.563N	144-59.067E
2014 - 12 - 10	02:19	12-10	12:19	Ahyi survey at summit (SOL 339) - WCD and multibeam		
2014 - 12 - 10	02:40	12-10	12:40	No pinging. Problem with multibeam system. Power-cycled the TRU (transceiver unit). Ran BIST (Built-in Self Test).		
2014 - 12 - 10	04:14	12-10	14:14	Passed BIST test. Ben noticed external trigger button checked so the system was not logging.		
2014 - 12 - 10	04:40	12-10	14:40	Multibeam system working again.		
2014 - 12 - 10	05:24	12-10	15:24	CTD V14B-07 deployed (Ahyi)	20-22.640N	145-01.654E
2014 - 12 - 10	05:36	12-10	15:36	CTD V14B-07 @ 500m	20-22.638N	145-01.655E
2014 - 12 - 10	06:21	12-10	16:21	CTD V14B-07 on deck	20-22.640N	145-01.656E
2014 - 12 - 10	07:30	12-10	17:30	CTD V14B-08 Deployed (Ahyi)	20-26.218N	145-01.774E
2014 - 12 - 10	07:45	12-10	17:45	CTD V14B-08 On Deck	20-26.221N	145-01.773E
2014 - 12 - 10	08:18	12-10	18:18	Logging EM122 water column data at Ahyi (SOL 341).		
2014 - 12 - 10	08:30	12-10	18:30	CTD V14B-09 deployed	20-26.150N	145-01.739E
2014 - 12 - 10	09:02	12-10	19:02	CTD V14B-09 on deck	20-26.148N	145-01.732E
2014 - 12 - 10	09:12	12-10	09:12	End EM122 water column data logging (EOL 342).		
2014 - 12 - 10	09:25	12-10	19:25	Logging EM122 WCD and multibeam at Ahyi.		
2014 - 12 - 10	09:56	12-10	19:56	End EM122 data logging (EOL 343).		
2014 - 12 - 10	10:14	12-10	20:14	CTD ops canceled due to weather.		
2014 - 12 - 10	10:47	12-10	10:47	Logging EM122 data - bathy and WCD (Ahyi) (SOL 344)		
2014 - 12 - 10	12:01	12-10	22:01	End survey at Ahyi (EOL 346). Head NE to start "east of Ahyi" survey. Do not sure lines 347 and 348.		
2014 - 12 - 10	13:45	12-10	23:45	Official "east of Ahyi" survey (SOL 349).		
2014 - 12 - 10	21:45	12-11	07:45	End EM122 logging.		
2014 - 12 - 10	22:00	12-11	08:00	Back deck ops after rough weather. Repairs to Jason.		
2014 - 12 - 11	05:25	12-11	15:25	Complete deck ops.		

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2014 - 12 - 11	05:32	12-11	15:32	Leaving Ahyi transit toward NW Eifuku. Logging EM122 (SOL 367)		
2014 - 12 - 11	13:09	12-11	23:09	On site at Daikoku for CTD. Stop EM122 logging (EOL 381).		
2014 - 12 - 11	14:30	12-12	00:30	CTD T14B-03 tow deployed (Daikoku)	20-32.421N	145-06.920E
2014 - 12 - 11	17:46	12-12	03:46	CTD tow on deck	20-16.723N	145-26.644E
2014 - 12 - 11	18:00	12-12	04:00	Moving to Jason wire test site NW of Daikoku		
2014 - 12 - 11	20:04	12-12	06:04	Jason wire testing. Test weight deployed.	20-35.175N	145-08.660E
2014 - 12 - 12	00:25	12-12	10:25	End wire test (failed).		
2014 - 12 - 12	01:35	12-12	11:35	Plankton Net Cast Deployed (NW Eifuku)	21-29.253N	144-02.488E
2014 - 12 - 12	02:13	12-12	12:13	Plankton Net Cast @ 1560m	21-29.256N	144-02.490E
2014 - 12 - 12	02:21	12-12	12:21	Logging EM122 WCD over NW Eifuku - stationary over Champagne site during plankton net cast. Saw large plume in WCD (Lines 382; 383).		
2014 - 12 - 12	02:48	12-12	12:48	Plankton Net Cast on deck	21-29.255N	144-02.490E
2014 - 12 - 12	02:59	12-12	12:59	End EM122 WCD logging.		
2014 - 12 - 12	02:59	12-12	12:59	Logging multibeam bathy out to 7000m position to the east at the trench for another Jason cable inspection test. (Lines 384 - 401)		
2014 - 12 - 12	05:51	12-12	15:51	XBT 009	21-42.880N	144-34.113E
2014 - 12 - 12	11:31	12-12	21:31	End multibeam logging. (EOL 401). Z=7024m.		
2014 - 12 - 12	11:35	12-12	21:35	Begin Jason cable test at trench site.		
2014 - 12 - 12	17:45	12-13	03:45	End wire test. Decided need to cut ~4000 m of cable off.		
2014 - 12 - 12	17:48	12-13	03:48	Logging EM122 multibeam on way back from the trench to the arc (SOL 402).		
2014 - 12 - 13	01:50	12-13	11:50	Logging EM122 WCD and bathy at Daikoku. (Lines 419 - 424)		
2014 - 12 - 13	03:01	12-13	13:01	End EM122 logging.		
2014 - 12 - 13	04:00	12-13	14:00	CTD T14B-04 deployed (Daikoku)	21-19.667N	144-11.374E
2014 - 12 - 13	04:19	12-13	14:19	Logging EM122 WCD during tow-yo at Daikoku (Lines 424 - 428).		
2014 - 12 - 13	05:42	12-13	15:42	CTD tow T14B-04 on deck	21-18.938N	144-11.457E
2014 - 12 - 13	05:55	12-13	15:55	End EM122 WCD logging.		
2014 - 12 - 13	06:31	12-13	16:31	Logging EM122 multibeam bathy mapping at Daikoku (SOL 429).	21-16.915N	144-13.627E
2014 - 12 - 13	09:12	12-13	19:12	End of bathy survey at Daikoku (EOL 437). SOL 438 for transit Daikoku to NW Eifuku		
2014 - 12 - 13	09:56	12-13	19:56	End EM122 bathy logging (EOL 438). NW Eifuku		
2014 - 12 - 13	12:11	12-13	22:11	Jason J2-799 Deployed (NW Eifuku)	21-29.278N	144-02.514E
2014 - 12 - 13	12:13	12-13	22:13	Medea Deployed	21-29.278N	144-02.513E
2014 - 12 - 13	21:26	12-14	07:26	Medea On Deck	21-29.484N	144-02.571E
2014 - 12 - 13	21:36	12-14	07:36	Jason On Deck (dive duration weather limited)	21-29.480N	144-02.549E
2014 - 12 - 13	21:46	12-14	07:46	USBL Pole Raised	21-29.461N	144-02.541E
2014 - 12 - 13	22:34	12-14	08:34	CTD V14B-10 Deployed (NW Eifuku "double" profile over Champagne and Yellowcone)	21-29.230N	144-02.481E
2014 - 12 - 13	00:35	12-14	10:35	CTD on deck.		

Red-Jason ops; Blue-CTD ops; Purple-Multibeam ops; Orange-Hydrophone ops; Green-Plankton Net						
UTC is 10 hours behind local Guam time						
UTC date	**UTC time**	**Guam date**	**Guam time**	**Event Log - SRoF-14 - Ironman Expedition**	**latitude (N)**	**longitude (E)**
2014 - 12 - 13	01:07	12-14	11:07	Plankton Net Cast Deployed w/MAPR-72	21-29.228N	144-02.480E
2014 - 12 - 14	02:14	12-14	12:14	Plankton Net Cast @ 1550m	21-29.229N	144-02.481E
2014 - 12 - 14	02:48	12-14	12:48	Plankton Net Cast on deck	21-29.230N	144-02.481E
2014 - 12 - 14	04:30	12-14	14:30	CTD V14B-11 deployed (Eifuku summit crater)	21-24.753N	144-08.749E
2014 - 12 - 14	04:35	12-14	14:35	Logging EM122 WCD and multibeam during CTD at "big" Eifuku. (Line 439)		
2014 - 12 - 14	04:46	12-14	14:46	CTD @ 443m	21-24.742N	144-08.751E
2014 - 12 - 14	04:55	12-14	14:55	End EM122 WCD. Continue logging multibeam on way to Daikoku.		
2014 - 12 - 14	05:12	12-14	15:12	CTD on deck.	21-24.741N	144-08.751E
2014 - 12 - 14	06:53	12-14	16:53	Logging EM122 WCD at Daikoku (Lines 440 - 441).		
2014 - 12 - 14	07:12	12-14	17:12	End EM122 WCD logging.		
2014 - 12 - 14	07:13	12-14	17:13	Logging EM122 multibeam. Heading to Ahyi. (Lines 442 - 446)		
2014 - 12 - 14	13:41	12-14	23:41	End EM122 logging (EOL 446).		
2014 - 12 - 14	15:26	12-15	01:26	XBT 010	20-21.122N	144-55.052E
				Begin transit from Ahyi to NW Rota-1 along the back-arc, while collecting multibeam bathy.		
2014 - 12 - 14	15:32	12-15	01:32	EM122 multibeam mapping from Ahyi to back-arc where will start official survey. (SOL 447)		
2014 - 12 - 14	16:05	12-15	02:05	EM122 multibeam mapping. Official start of Back-arc survey (SOL 449).		
2014 - 12 - 15	03:50	12-15	13:50	Arrive at area for CTD dunk test. (Do not use MB lines 474 - 476)		
2014 - 12 - 15	04:10	12-15	14:10	CTD V14B-12 deployed in Back-arc (Dunk test) "Clean bottle" test.	18-45.120N	144-38.157E
2014 - 12 - 15	04:25	12-15	14:25	CTD @ 750m	18-45.121N	144-38.157E
2014 - 12 - 15	04:46	12-15	14:46	CTD on deck	18-45.123N	144-38.155E
2014 - 12 - 15	04:54	12-15	14:54	Logging EM122 multibeam resuming Back-arc survey. (SOL 477)		
2014 - 12 - 15	05:18	12-15	15:18	XBT 11		
2014 - 12 - 16	03:39	12-16	13:39	End EM122 multibeam logging (EOL 526) / arrive at NW Rota-1 summit.	18-42.196N	144-38.790E
2014 - 12 - 16	04:23	12-16	14:23	Hydrophone mooring release code sent.		
2014 - 12 - 16	04:35	12-16	14:35	Mooring on surface.		
2014 - 12 - 16	06:00	12-16	16:00	Mooring on deck. (Did not re-deploy)		
2014 - 12 - 16	08:45	12-16	18:45	CTD V14B-13 deployed. (NW Rota1) "Clean-bottle" test #2.	14-36.07N	144-48.61E
2014 - 12 - 16	09:39	12-16	19:39	CTD on deck.		
2014 - 12 - 16	09:40	12-16	19:40	Logging EM122 WCD and multibeam at NW Rota-1 summit. (SOL 527		
2014 - 12 - 16	11:30	12-16	21:30	End EM122 logging (EOL 531).		
2014 - 12 - 16	20:30	12-17	06:30	USBL Pole lowered	14-36.055N	144-46.474E
2014 - 12 - 16	20:45	12-17	06:45	Jason J2-800 deployed (NW Rota-1)	14-36.056N	144-46.475E
2014 - 12 - 16	20:47	12-17	06:47	Medea deployed	14-36.056N	144-46.475E
2014 - 12 - 17	05:00	12-17	15:00	Medea on deck	14-36.042N	144-46.467E
2014 - 12 - 17	05:10	12-17	15:10	Jason on deck (dive duration weather limited)	14-36.044N	144-46.323E

Red-Jason ops; Blue-CTD ops; Purple-Multibeam ops; Orange-Hydrophone ops; Green-Plankton Net						
UTC is 10 hours behind local Guam time						
UTC date	**UTC time**	**Guam date**	**Guam time**	**Event Log - SRoF-14 - Ironman Expedition**	**latitude (N)**	**longitude (E)**
2014 - 12 - 17	05:14	12-17	15:14	USBL Pole raised	14-36.075N	144-46.397E
2014 - 12 - 17	05:15	12-17	15:15	Logging EM122 multibeam on the way to Urashima vent in S back-arc (SOL 532).		
2014 - 12 - 17	09:45	12-17	19:45	End EM122 logging (EOL 522) for transducer test (BIST).		
2014 - 12 - 17	15:55	12-18	01:55	USBL Pole lowered	12-55.303N	143-38.849E
2014 - 12 - 17	16:10	12-18	02:10	Jason J2-801 deployed (Urashima S back-arc)	12-55.303N	143-38.895E
2014 - 12 - 17	16:11	12-18	02:11	Medea deployed	12-55.303N	143-38.895E
2014 - 12 - 17	23:56	12-18	09:56	Elevator Deployed	12-55.345N	143-38.944E
2014 - 12 - 18	08:35	12-18	18:35	Jason and Medea on deck (weather limited)	12-55.411N	143-39.101E
2014 - 12 - 18	09:50	12-18	19:50	Elevator on deck, USBL Pole raised	12-55.247N	143-38.828E
2014 - 12 - 18	10:03	12-18	20:03	Logging EM122 multibeam between Urashima and Seamount X (SOL 542).		
2014 - 12 - 18	10:11	12-18	20:11	XBT 012	12-56.415N	143-40.281E
2014 - 12 - 18	12:31	12-18	22:31	End EM122 logging at Seamount X summit (EOL 546).		
2014 - 12 - 18	12:58	12-18	22:58	CTD T14B-05 Deployed (Seamount X)	13-14.699N	144-00.522E
2014 - 12 - 18	13:44	12-18	23:44	Logging EM122 WCD and multibeam.		
2014 - 12 - 18	15:08	12-19	01:08	Stop logging EM122 data.		
2014 - 12 - 18	15:40	12-19	01:40	CTD on deck	13-15.233N	144-01.895E
2014 - 12 - 18	16:32	12-19	02:32	Logging EM122 multibeam. (Sol 550). Will survey Seamount X; Forecast and N of Gardner data in back-arc (E->W and W->E).		
2014 - 12 - 18	17:20	12-19	03:20	Over Seamount X logging multibeam.		
2014 - 12 - 18	17:38	12-19	03:38	XBT 013	13-19.937N	143-57.642E
2014 - 12 - 18	17:40	12-19	03:40	Coming up on Forecast (Line 552)		
2014 - 12 - 19	03:28	12-19	13:28	End EM122 logging (EOL 573). W edge of back-arc data gap.		
2014 - 12 - 19	03:30	12-19	13:30	ADCP survey continuing W to crest of W Mariana Ridge.		
2014 - 12 - 19	06:03	12-19	16:03	Logging EM122 mutlibeam (SOL 574).W to E. Data very noisy due to going into high seas.		
2014 - 12 - 19	21:22	12-20	07:00	End EM122 logging and all science ops (EOL 604). Weather too rough to continue.		
				Ship moved to the west coast of Guam to seek calm water and let everyone pack up.		
2014 - 12 - 20	22:00	12-21	08:00	At Navy pier in Guam.		

Abbreviated summary of cruise ops

29 Nov – Depart Guam, transit to Snail/Urashima vents in S back-arc

30 Nov-1 Dec – Jason dive **J2-797** at Snail/Urashima vents in S back-arc

1-2 Dec – Transit to NW Rota-1, conducted ship ops but could not dive with Jason due to typhoon passing S of Guam

2-4 Dec – Transit north to Ahyi for CTD and multibeam ops, then further north to NW Eifuku

4-5 Dec – Jason dive **J2-798** at NW Eifuku. Dive terminated due to weather. Jason recovery aborted due to weather.

6-8 Dec – Bad weather for 3 full days while towing Jason/Medea at 1 knot to ENE toward trench. Multibeam only.

9 Dec – Medea/Jason recovered on deck. Discovered cable badly damaged at ~ 250 m wire-out. Back to arc.

10-11 Dec – Bad weather while assess situation and repair Jason tether on deck. CTD/multibeam at Ahyi and Eifuku.

12 Dec – 1st cable inspection test (failed). Transit to trench for 2nd cable inspection test. Back to arc, CTD at Daikoku.

13 Dec – Cut off ~4000 m of cable. Cable re-termination. Jason repair. Daikoku CTD, Jason dive **J2-799** at NW Eifuku.

14 Dec – Dive duration limited due to weather. Other ops at NW Eifuku, Eifuku, Daikoku, Ahyi.

15-16 Dec – Depart Ahyi for NW Rota, transit south along back-arc to collect multibeam bathy. Recover hydrophone.

17 Dec – Jason dive **J2-800** at NW Rota-1 (start delayed 12 hrs and duration limited due to weather). Transit to Urashima

18 Dec – Jason dive **J2-801** at Urashima vent in S back-arc (duration limited due to weather). CTD @ Seamount X.

19 Dec – Multibeam and ADCP survey west of Guam along line E->W, then back W->E.

20 Dec – Science ops suspended due to weather.

21-Dec – Arrive Guam.

Summary of time lost during cruise: 7 days lost to bad weather, 4 days lost to Jason/Medea cable problems. Also four of the five Jason dives were shortened due to weather.

3 – Cruise Participants

Name	Employer	Expertise	Role
Science Group:			
Craig Moyer	WWU	Microbiology	Chief Scientist, PI
Bill Chadwick	OSU	Geology	Co-Chief Scientist, PI
Shawn Arellano	WWU	Macrobiology	Scientist
Andra Bobbitt	OSU	Data management	Technician
Nathan Buck	UW	Plume chemistry	Technician
Dave Butterfield	UW	Chemistry	Principal Investigator
Dave Emerson	Bigelow Labs	Microbiology	Principal Investigator
Leigh Evans	OSU	Gas geochemistry	Technician
Matt Fowler	OSU	Moorings	Technician
Heather Fullerton	WWU	Microbiology	Post-Doc
Kevin Hager	WWU	Microbiology	Graduate Student
Ben Larson	UW	Chemistry	Post-Doc
Anna Leavitt	Bigelow Labs	Microbiology	Technician
Saskia Madlener	OSU	Videographer	Videographer
Sean McAllister	UDE	Microbiology	Graduate Student
Susan Merle	OSU	Mapping	Technician
Sheryl Murdock	UVic	Microbiology	Graduate Student
Joe Resing	UW	Plume Chemistry	Principal Investigator
Kevin Roe	UW	Chemistry	Technician
Jarrod Scott	Bigelow Labs	Microbiology	Post-Doc
Jason Sylvan	USC	Microbiology	Scientist
Verena Tunnicliffe	Univ. of Victoria	Macrobiology	Principal Investigator
Sharon Walker	NOAA/PMEL	CTD/MAPR	Scientist
JASON Group:			
Tito Collasius	WHOI	Jason	Expedition Leader
Casey Agee	WHOI	Jason	Jason team
Fred Denton	WHOI	Jason	Jason team
Robert Elder	WHOI	Jason	Jason team
Scott Hansen	WHOI	Jason	Jason team
Akel Kevis-Stirling	WHOI	Jason	Jason team
Scott McCue	WHOI	Jason	Jason team
James Pelowski	WHOI	Jason	Jason team
James Varnum	WHOI	Jason	Jason team
Korey Verhein	WHOI	Jason	Jason team
Ship Support:			
Matt Durham	SIO	Revelle	Marine Technician
Ben Cohen	SIO	Revelle	Marine Technician

4 - Discipline Summaries:

4.1 Biology-

4.1.1 Microbiology

4.1.1.1 Moyer Lab Cruise Objectives

Participants from Moyer Lab:
Craig Moyer, Professor & Chief Scientist, Western Washington University
Heather Fullerton, Post-doctoral Fellow, Western Washington University
Kevin Hager, Graduate Student, Western Washington University

Overarching goals: Greater understanding of small-scale spatial diversity of iron-oxidizing Bacterial (FeOB) communities, identification of populations within community types, identification of specific *Zetaproteobacterial* operational taxonomic units or OTUs (akin to species or populations). Through the use of the BioMat Syringe (BMS) sampler, the architecture of these mats will be studied in high-resolution detail across various chemical gradients. *Zetaproteobacteria* influence their environment by being the primary producers and establishing the physical structure of the microbial mats through the production of exopolysaccharides, which in turn generates varying microbial mat morphotypes. Functional and phylogenetic diversity will be assessed in greater detail with the goal of correlating these data with localized geochemistry measurements.

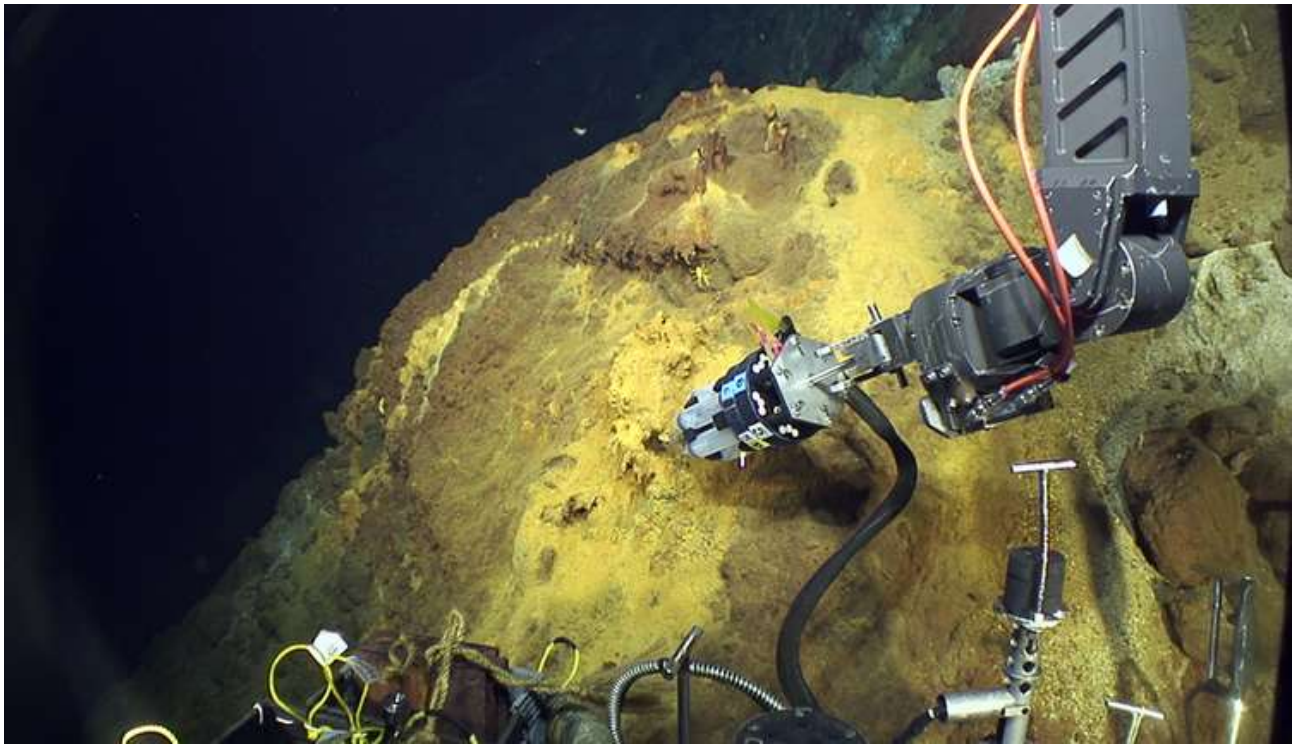
Our specific molecular microbiological techniques include, (1) terminal-restriction length polymorphisms, or T-RFLP fingerprinting using SSU rRNA gene targets, (2) Q-PCR targeting both taxonomic groups and representative functional genes used as indicators of potential metabolic pathways and (3) metagenomics using Illumina NextGen sequencing enabling us to sequence genomes from the entire microbial mat community.

The use of T-RFLP serves two purposes. First, it is a sensitive genotyping method that will yield a microbial community fingerprint to allow us to compare samples from this cruise to samples collected in previous years using cluster analysis. Second, it is a high-throughput screening process to help identify candidate samples for the more in depth Q-PCR and logistically intensive metagenomics analyses.

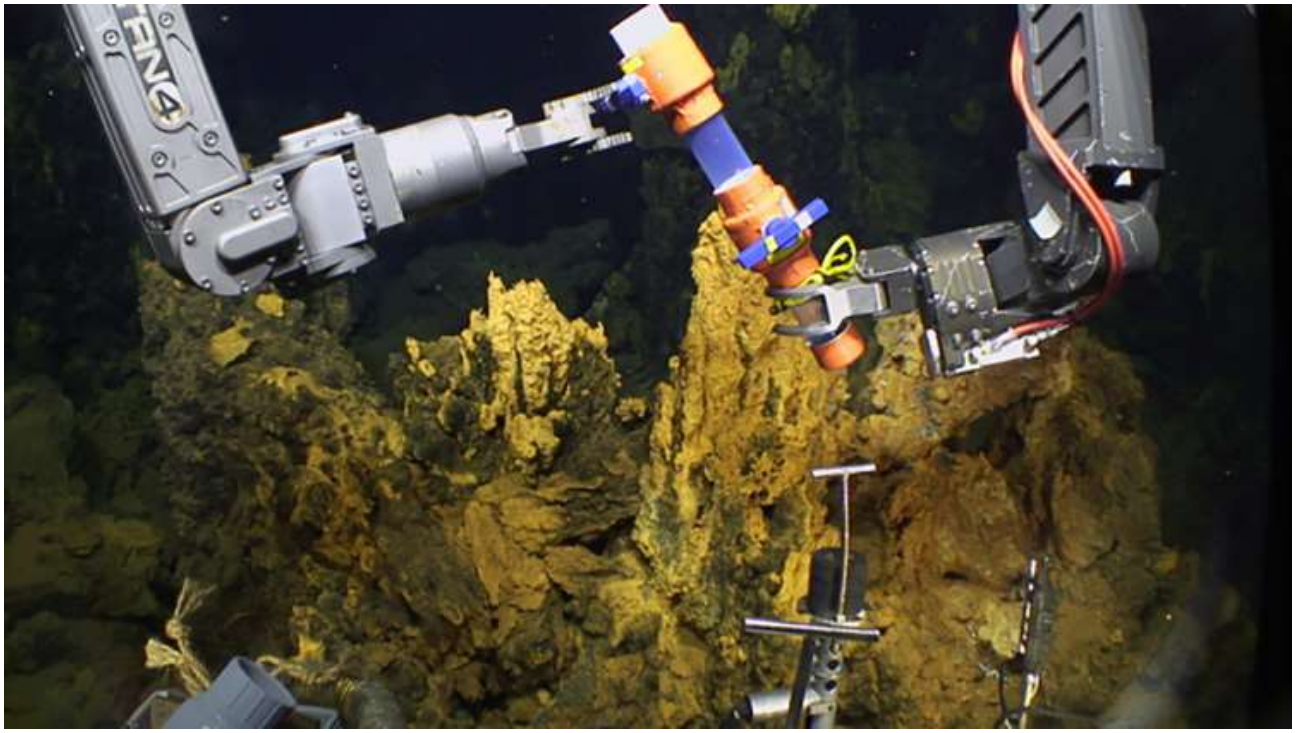
Our Q-PCR approach allows us to estimate the total abundance of both *Bacteria* and *Archaea* as well as groups such as *Zetaproteobacteria* and *Chloroflexi*. In addition, we now have developed novel assays using non-degenerate primers (based on feedback from our previous iron-mat metgenomics) for genes associated with the Calvin Benson Bassham (CBB) and reductive tricarboxylic acid (rTCA) carbon fixation pathways, *cbb*M and *acl*B, respectively. We also have similar assays for nitrogen cycling pathways that include nitrogen fixation (*nif*H) and denitrification (*nir*K). Finally, we also have an assay for detecting arsenic detoxification (*ars*C) and the presence of cytochromes hypothesized to help facilitate iron-oxidation (*cyc*2). Each of these assays will estimate the gene copy number per genomic DNA from each sample. These data can then be assessed using nonparametric multidimensional scaling (NMDS) and analysis of variance statistics.

Finally, we plan to preform comparative metagenomics analysis among different microbial communities along the Mariana Arc and Back-arc to determine a detailed examination of both taxonomic and metabolic diversity. Metagenomics, or environmental genomics, uses next generation sequencing to assay the total genomic content of a sampled microbial community. The sequence analysis uses two different approaches. The first is to do SSU rDNA reconstructions and the second is the assembly and annotation of the metagenome. SSU rDNA reconstruction will be performed with expectation maximization iterative reconstruction of genes from the environment (EMIRGE). The output of this will yield full length SSU rDNA sequences that will be used to construct phylogenetic trees with RAxML to show relationships between samples at our study sites and other microbial taxa. EMIRGE will also provide an estimate for abundance along with a distribution for each of these sequences to compare with other microbial mat communities. These data can then be transformed into rarefaction curves to yielding OTU rank-abundance to aid in assessing evenness and richness. From there, velvet will be used for contig assembly and prodigal will be used to determine open reading frames (ORFs). With the predicted ORFs, BLASTp will be used to identify similar proteins in the NCBI RefSeq database. This process will yield all the known genetic potential of each microbial mat community. These BLAST results can be plugged into a program such as Megan5 to assign a function and phylogeny to each detected ORFS. From the SEED and KEGG hierarchy large scale comparisons of metagenomes can be made with heat maps as a visualization tool. If a specific category proves to be an interesting phenomenon, metabolic pathways in KEGG can be compared between samples with heat maps to show

relative gene abundances. In addition gene coverage data will be used to determine quantitive gene abundance within each sample that can be compared to Q-PCR data.



BioMat cassette sampler at NW Eifuku.



Jason operating the scoop sampler at Urashima.

Below is the list of samples we have collected and preserved for further processing back in the lab using the molecular microbiological methods described above.

Table 4.1.1.1-1

Sample	Site	Date (GMT)	Start Sampling Time (GMT)	Start Sample VV Event Number	Amount	Notes
J2-797 SNAIL and URASHIMA						
J2-797-BM1-D156	Snail Mkr 108	11/30/2014	12:12:21	817	4 x 0.5mL, 1 x 5 mL in 50mL tubes, D1 D5 D6 not combined	
J2-797-BM1-D234	Snail Mkr 108	11/30/2014	12:24:55	837	4 x 0.5mL, 1 x 5 mL in 50mL tubes are all seperated	Note: D4 labled as B4
J2-797-BM1-C12	Saipanda Horn/Active Chimney	12/1/2014	6:42:09	2494	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-797-BM1-C34	Saipanda Horn/Active Chimney	12/1/2014	6:58:04	2518	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-797-LScoop2	Saipanda Horn/Active Chimney	12/1/2014	9:14:12	2696	6 x 10ml (2 are cracked)	Just above previous suction sample
J2-797-BM1-B12	Snap Snap	12/1/2014	11:10:32	2884	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-797-BM1-B56	Snap Snap	12/1/2014	11:13:23	2889	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-797-BM1-B3	Snap Snap	12/1/2014	11:17:07	2895	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-797-Lscoop-1	Snap Snap	12/1/2014	11:24:48	2907	2 x 10ml	
J2-798 NW EIFUKU						
J2-798-BM1-B123456	Mkr 144	12/5/2014	12:13:25	4669	4 x 0.5mL, 1 x 5 mL in 50mL tubes	White "creamy" mat overlayed on sulfur
J2-798-BM1-C12	yellow cone 2014	12/5/2014	14:46:33	4950	4 x 0.5mL, 1 x 5 mL in 50mL tubes	Fluffy lighter mat more yellow on top of darker orange mat
J2-798-BM1-C346	yellow cone 2014	12/5/2014	16:24:36	5124	4 x 0.5mL, 1 x 5 mL in 50mL tubes	Light fluffy mat
J2-798-BM1-D12346	yellow cone 2014	12/5/2014	17:30:40	5234	4 x 0.5mL, 1 x 5 mL in 50mL tubes	Weird clumpy chimney structure
J2-798-Lscoop-3	down from Mkr 124	12/5/2014	20:13:13	5489	6 x 10ml	
J2-798-Lscoop-1	Yellow Cone Mkr 146	12/5/2014	21:54:45	5678	8 x 10ml	
J2-798 NW EIFUKU						
J2-799-BM1-D124	Mkr 146 upper yellow cone	12/13/2014	15:19	12054	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-799-BM1-D56	Mkr 146 upper	12/13/2014	16:21	12174	4 x 0.5mL, 1 x 5 mL in 50mL tubes	

Sample	Site	Date (GMT)	Start Sampling Time (GMT)	Start Sample VV Event Number	Amount	Notes
	yellow cone					
J2-799-BM1-D3	Mkr 146 upper yellow cone	12/13/2014	16:27	12185	4 x 0.5mL, 1 x 5 mL in 50mL tubes	Super light and fluffy
J2-799-BM1-B156	Mkr 146 upper yellow cone	12/13/2014	16:43	12219	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-799-Lscoop-4	Mkr 124 lower yellow cone	12/13/2014	13:57	11898	11 x 15ml	
J2-799-Lscoop-1	Mkr 146 upper yellow cone	12/13/2014	15:57	12125	6 x 15ml	
J2-799-Shrimp	Razorback	12/13/2014	18:49	12438	~9 frozen whole in sea water and ~6 preserved for FISH	
Unfiltered CTD Water	Eifuku	12/13/2014	NA	NA	2L in 4C	Bottle #30 from CTD
J2-800 NW Rota						
J2-800-Lscoop-2	Tip Ice-14	12/17/2014	1:41:41	13356	4 x 0.5mL + lots of tubes	
J2-800-BM1-C124	Tip Ice-14	12/17/2014	2:05:07	13390	a few grams, didn't settle, frozen in suspension	Sulfur mat, very little sample
J2-800-BM1-B12456	Olde Iron Slides	12/17/2014	4:07:12	13639	4 x 0.5mL	Thin Fe mat
J2-800-scoop-8	Olde Iron Slides	12/17/2014	4:22:44	13673	4 x 0.5mL + some more tubes	Fluffy lighter mat more yellow on top of darker orange mat
J2-801 URASHIMA						
J2-801-LScoop1	Golden Horn	12/17/2014	22:32	14355		
J2-801-LScoop8	Golden Horn	12/17/2014	22:49	14390		
J2-801-BM1-D246	Golden Horn (top)	12/18/2014	3:05	14727	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-801-SS	Golden Horn (top)	12/18/2014	3:25	14768		
J2-801-LScoop4	Golden Horn (top)	12/18/2014	3:51	14801		
J2-801-BM1-X126	Golden Horn (base)	12/18/2014	4:11	14835	4 x 0.5mL, 1 x 5 mL in 50mL tubes	
J2-801-BM1-X345	Golden Horn (middle)	12/18/2014	4:56	14920	4 x 0.5mL, 3 x 5 mL in 50mL tubes	

4.1.1.2 Emerson Lab Cruise Objectives

Participants from Emerson Lab:
Dr. David Emerson, Senior Research Scientist, Bigelow Laboratory
Dr. Jarrod Scott, Postdoctoral Research Scientist, Bigelow Laboratory
Ms. Anna Leavitt, Technician, Bigelow Laboratory

For the 2014 Ring of Fire cruise the Emerson Lab established an ambitious range of objectives related to studying the microbiology of iron mats associated with the hydrothermal vents that were the focus of this cruise. Given the technical and weather-related issues that occurred with this cruise not all objectives were met; however many were achieved, at least in some aspect. In addition to these objectives, we were responsible for overseeing the operation and maintenance of the microbial mat sampler.

Primary objectives and outcomes.
1. Collection of multiple samples from different iron microbial mat ecosystems as part of a broad survey of diversity of Fe-oxidizing communities based on amplicon sequencing of 16S.
Samples, primarily from the microbial mat sampler were collected at all the primary sites visited. To the extent possible, the geochemistry of these same sites was determined with the HFS to obtain samples that have some geochemical data associated with them.

2. Systematic sampling of several (2 – 5, depending upon what we find) of selected iron mat systems, doing depth profiles, if possible, and longitudinal samplings.
The only systematic sampling that could be done as part of this cruise was at Golden Horn tower at the Urashima site. This tower is 6 – 7m tall and the base has some sulfide minerals associated with it, but the upper part appears to be almost entirely soft iron oxides, the implication being that it is composed of biogenic oxides. Diffuse venting sites at the base, mid-point area, and summit were sampled for microbiology and geochemistry.

3. Mat morphology analysis.
A sample was collected from the Golden Horn site using a large scoop to try to preserve the natural mat structure for dissection and analysis. This yielded several samples that were embedded in agarose and fixed so that they could be sectioned at a later date. In addition, samples of more hardened minerals were obtained for mineralogical and microscopic analysis.

4. Productivity chambers
Three chambers (#1, #2, #3) were deployed at Yellow Cone site at Eifuku in an area of very diffuse venting, one of these (#3) with an MTR associated with it. These were collected after 8 days. Chamber #3 had a modest amount of microbial growth associated with it, while the other two had little growth. Samples were collected from all three for later DNA analysis. Samples from chamber #3 were processed for estimating microbial growth during deployment; the other 2 chambers did not have enough material for these estimates.

5. Fe-reduction experiments.
Two sets of MPN tubes for FeRB was inoculated from samples collected from Eifuku, and one set from the Golden Horn site at Urashima. The MPN results for the Golden Horn sample were detectable, but very low, approximately ≤ 10^2 cells/cc of mat. Results from Eifuku were more significant with a range of 10^3 – 10^4 Fe-reducers/cc present. An attempt at isolating an Fe-reducing bacterium from one of these sample is ongoing.

6. Isolation of new FeOB.
We attempted several enrichments for FeOB using an artificial seawater medium and zero valent iron. These are done as liquid in petri plates and incubated in anaerobic jars with campypaks. The other enrichments were done in serum bottles with anoxic ASW and additions of $FeCl_2$ and air to create a microaerobic system. Enrichments were done from Snail, Eifuku, Rota, and Urashima. Thus far, one successful enrichment/isolate has been acquired from the Mkr 108 site at Snail. This is a rod-shaped bacterium that does not form any extracellular structures and grows very well on ZVI, but not heterotrophic medium. It is currently being identified and characterized for full growth characteristics.

7. Collection of samples that can be used for later single cell genomic analysis, FISH analysis. We also expect to collaborate with Roman Barco (USC) in collection of some samples that can be used for proteomic analysis.
Samples were collected from all the major sites that we visited and samples were preserved for single cell genome analysis. We were unable to collect any samples for proteomic analysis.

8. Deployment of traps to capture protists.

This was done in conjunction with Cheryl Murdock from University of Victoria. Protist traps were deployed at Eifuku and recovered. (See section 4.1.1.3.)

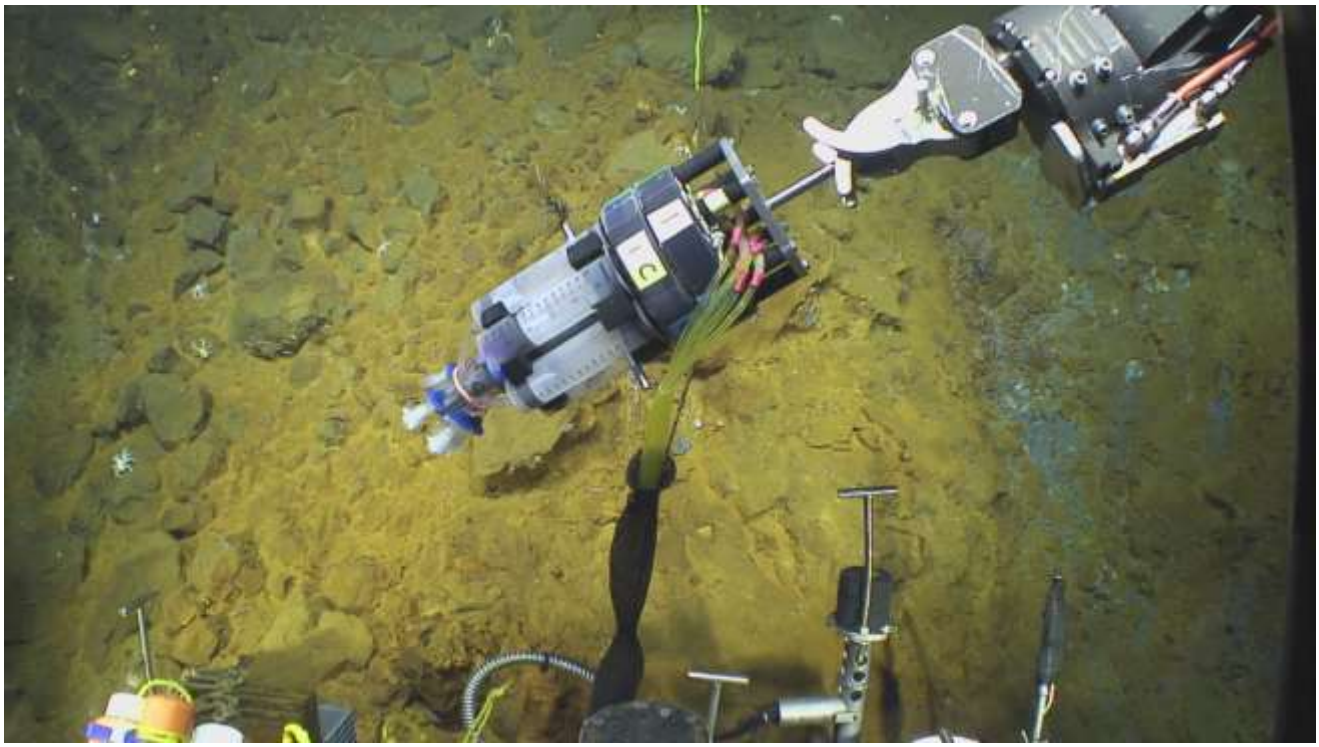
9. *Attempt to concentrate viruses from mat samples using iron-flocculation method and/or filtration.*
This objective was not done due to overall lack of samples that were collected.

10. *Collect bulk samples of iron mat (using suction sampler) and use a series of progressively smaller filters (1000uM to 100uM) to sieve for invertebrates in mats, specifically but not limited to worms, copepods, etc.* One attempt was made at this approach, however we did not find obvious evidence for invertebrates in this sample, whether this was due to technical issues or a lack of meiofauna was difficult to determine.

Use of mat sampler. Overall the mat sampler performed adequately. It was deployed and used on all five dives, in cases where elevators were used, multiple cassettes were utilized. On the first dive J797, a tag line was lost during elevator recovery, resulting in uncontrolled swinging of the elevator, and loss of one cassette containing six syringe samples. Following this a lid was constructed for the elevator box that held cassettes, so the lid could be bungeed close to prevent such losses in the future. This reduced the number of cassettes from four to three, however a fourth cassette (cassette X) was assembled from spare parts during the cruise and deployed on the final dive and worked successfully. We also encountered issues with the solenoid valves nonfunctioning by not closing properly. This problem was remedied for solenoid #3 by blocking this valve unit and then repositioning the cassette head on the unit each time so that the #5 valve could be used to operate the #3 cassette. On the final dive a similar issue was found with the #6 valve. This was remedied by starting sampling of each cassette with the #6 syringe, which once full was OK.

In addition to collecting microbial iron mat and sulfur mat samples at high spatial resolution, the mat sampler was used to collect porewaters from within mats that was prefiltered *in situ*, providing clean, particle free porewater from within the mats for analyses like determination of dissolved organic carbon or dissolved inorganic carbon. Several samples were also collected with syringes pre-filled with RNA later so that RNA could be extracted.

A first for the mat sampler on this cruise was to do *in situ* ferrozine assays from within mats to assess how much Fe(II) was present. The syringe was prefilled with 10 ml of ferrozine and then a small amount of prefiltered fluid water was drawn in, resulting in a colorimetric change, upon return to the surface the Fe(II) concentration of the vent fluid was determined spectrophotometrically.



BioMat cassette sampler with ferrozine at NW Eifuku, J2-799.

Table 4.1.1.2-1 List of all individual syringe samples collected with bio mat sampler.

timeUTC	sample	site	comments	latitude	longitude	depth	hdg	vv
11:45	J797-BM1-A2-07	Mkr 108 site	Cassette A Syringe 1. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?)in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	773
11:47	J797-BM1-A3-08	Mkr 108 site	Cassette A Syringe 3. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?)in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	775
11:52	J797-BM1-A5-09	Mkr 108 site	Cassette A Syringe 5. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?)in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	784
11:54	J797-BM1-A4-10	Mkr 108 site	Cassette A Syringe 4. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?)in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	787
11:58	J797-BM1-A1-11	Mkr 108 site	Cassette A Syringe 1. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?)in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	794
12:00	J797-BM1-A6-12	Mkr 108 site	Cassette A Syringe 6. This one fills the cassette. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?)in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	797
12:12	J797-BM1-D1-13	Mkr 108 site	Cassette D Syringe 14. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water near last site. Jason T=27C. Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	309	811
12:14	J797-BM1-D6-14	Mkr 108 site	Cassette D Syringe 6. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water near last site. Jason T=27C. Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	309	819
12:15	J797-BM1-D5-15	Mkr 108 site	Cassette D Syringe 14. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water near last site. Jason T=27C. Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	309	822
12:24	J797-BM1-D3-16	Mkr 108 site	Cassette D Syringe 14. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water next to last site. Jason T=57C.	12 57.166	143 37.142	2850	310	837
12:25	J797-BM1-D2-17	Mkr 108 site	Cassette D Syringe 2. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water next to last site. Jason T=57C.	12 57.166	143 37.142	2850	310	839
12:26	J797-BM1-D4-18	Mkr 108 site	Cassette D Syringe 2. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water next to last site. Jason T=57C.	12 57.166	143 37.142	2850	310	840

timeUTC	sample	site	comments	latitude	longitude	depth	hdg	vv
6:42	J797-BM1-C1-34	Saipanda Horn	Cassette C Syringe 1. Sample site: bottom of skinny spire near top of Saipanda with soft iron oxide mats and clear flow. Jason T=19.9. Collected more material into Syringe 1 after sample 35.	12 55.333	143 38.950	2928	268	2492
6:44	J797-BM1-C2-35	Saipanda Horn	Cassette C Syringe 2. Sample site: bottom of skinny spire near top of Saipanda with iron mats and clear flow. Jason T=19.9.	12 55.333	143 38.950	2928	268	2495
6:58	J797-BM1-C3-36	Saipanda Horn	Cassette C Syringe 3. About 15cm below samples 34-35.	12 55.333	143 38.950	2928	268	2519
7:00	J797-BM1-C4-37	Saipanda Horn	Cassette C Syringe 4. Same location as sample 36.	12 55.333	143 38.950	2928	268	2522
11:10	J797-BM1-B2-47	Snap Snap	Cassette B Syringe 2. Sample site: Fluffy-orange iron mats on small chimney-like structure with active flow.	12 55.333	143 38.950	2928	253	2884
11:12	J797-BM1-B1-48	Snap Snap	Cassette B Syringe 1. (same location)	12 55.333	143 38.950	2928	253	2887
11:13	J797-BM1-B6-49	Snap Snap	Cassette B Syringe 6. (same location)	12 55.333	143 38.950	2928	253	2889
12:17	J798-BM-B2-11	Champagne Site (at Mkr144)	Cassette B. Syringe 2. (White mat overlaid on sulfur at same location).	21 29.2442	144 2.4851	1606	67	4677
12:18	J798-BM-B1-12	Champagne Site (at Mkr144)	Cassette B. Syringe 1. (same location)	21 29.2442	144 2.4851	1606	67	4681
12:19	J798-BM-B6-13	Champagne Site (at Mkr144)	Cassette B. Syringe 6. (same location)	21 29.2442	144 2.4851	1606	67	4683
12:20	J798-BM-B5-14	Champagne Site (at Mkr144)	Cassette B. Syringe 5. (same location)	21 29.2442	144 2.4851	1606	67	4685
12:21	J798-BM-B4-15	Champagne Site (at Mkr144)	Cassette B. Syringe 4. (same location)	21 29.2442	144 2.4851	1606	67	4687
12:25	J798-BM-B3-16	Champagne Site (at Mkr144)	Cassette B. Syringe 3. Different valve. (same location)	21 29.2442	144 2.4851	1606	67	4696
14:46	J798-BM-C1-17	Yellow Cone (at Mkr146)	Cassette C. Syringe 1. Light yellow mat on top of darker orange mat. (From right of ShrimpTrap2)	21 29.2651	144 2.5188	1579	245	4950
14:55	J798-BM-C2-18	Yellow Cone (at Mkr146)	Cassette C. Syringe 2. (same mat as sample 17)	21 29.2651	144 2.5188	1579	245	4963
15:21	J798-BM-C4-19	Yellow Cone (at Mkr146)	Cassette C. Syringe 4. Repositioned slightly. Sampled thick mat above 30C flow.	21 29.2651	144 2.5188	1579	257	5028
15:31	J798-BM-C6-20	Yellow Cone (at Mkr146)	Cassette C. Syringe 6. Slight reposition-still fluffy mat.	21 29.2651	144 2.5188	1579	253	5049
16:24	J798-BM-C3-24	Yellow Cone (at Mkr146)	Cassette C. Syringe 3. Same as samples 19-20	21 29.2651	144 2.5188	1579	254	5124
17:30	J798-BM-D1-25	Yellow Cone (at Mkr124)	Cassette D. Syringe 1. Sampling fluffy-covered chimney structure 10m from Mkr146.	21 29.2753	144 2.5201	1584	181	5234
17:37	J798-BM-D2-26	Yellow Cone (at Mkr124)	Cassette D. Syringe 2. (same location)	21 29.2753	144 2.5201	1584	181	5253

timeUTC	sample	site	comments	latitude	longitude	depth	hdg	vv
17:38	J798-BM-D4-27	Yellow Cone (at Mkr124)	Cassette D. Syringe 4. (same location)	21 29.2753	144 2.5201	1584	181	5256
17:42	J798-BM-D6-28	Yellow Cone (at Mkr124)	Cassette D. Syringe 6. (same location)	21 29.2753	144 2.5201	1584	181	5262
17:44	J798-BM-D3-29	Yellow Cone (at Mkr124)	Cassette D. Syringe 6. (same location)	21 29.2753	144 2.5201	1584	181	5268
15:08	J799-BM1-C1-09	Upper Yellow Cone - Mkr146	Cassette C. Syringe 1. Bio mat sampler with ferrozine. Location is slightly above the site where the instruments/samples 5-8 were recovered where fluffier mat observed. In crevice with flow. HFS probe measured 10degC.	21 29.2626	144 2.5232	1578	268	12024
15:19	J799-BM1-D1-10	Upper Yellow Cone - Mkr146	Cassette D. Syringe 1. Slight reposition below previous sample in mat with many shrimp. Light-colored mat surrounding good flow.	21 29.2635	144 2.5244	1580	245	12054
15:23	J799-BM1-D2-11	Upper Yellow Cone - Mkr146	Cassette D. Syringe 2. Same location.	21 29.2635	144 2.5244	1580	245	12061
15:25	J799-BM1-D4-12	Upper Yellow Cone - Mkr146	Cassette D. Syringe 4. Slightly left of sample 10-11 location in thick mat with crust on top	21 29.2635	144 2.5244	1580	245	12066
15:44	J799-BM1-C5-15	Upper Yellow Cone - Mkr146	Cassette C. Syringe 5. Biomat sampler with ferrozine. Same flow as sample 13-15.	21 29.2635	144 2.5244	1580	245	12102
15:47	J799-BM1-C4-16	Upper Yellow Cone - Mkr146	Cassette C. Syringe 4. Biomat sampler with geochemistry filter. Same location.	21 29.2635	144 2.5244	1580	245	12110
16:21	J799-BM1-D6-18	Upper Yellow Cone - Mkr146	Cassette D. Syringe 6. Crusty mat on top with flow. Location about 3 meters below sample 17.	21 29.2638	144 2.5243	1581	224	12168
16:22	J799-BM1-D5-19	Upper Yellow Cone - Mkr146	Cassette D. Syringe 5. Same location as sample 18.	21 29.2638	144 2.5243	1580	230	12176
16:28	J799-BM1-D3-20	Upper Yellow Cone - Mkr146	Cassette D. Syringe 3. Same location in light-fluffy mat under the crusty mat.	21 29.2638	144 2.5243	1580	230	12187
16:43	J799-BM1-B1-21	Upper Yellow Cone - Mkr146	Cassette B. Syringe 1. New mat with crusty top and fluffy underneath.	21 29.2638	144 2.5243	1581	230	12219
16:48	J799-BM1-B6-22	Upper Yellow Cone - Mkr146	Cassette B. Syringe 6. Same location.	21 29.2638	144 2.5243	1581	230	12229
16:49	J799-BM1-B5-23	Upper Yellow Cone - Mkr146	Cassette B. Syringe 5. Same location.	21 29.2638	144 2.5243	1581	230	12231
16:55	J799-BM1-C3-24	Upper Yellow Cone - Mkr146	Cassette C. Syringe 3. Biomat sampler with ferrozine. Same location.	21 29.2638	144 2.5243	1581	230	12239
2:04	J800-BM1-C1-21	TipIce	Cassette C. Syringe 1. At the same location at white sediments of TipIce.	14 36.060	144 46.578	526	64	13388
2:05	J800-BM1-C2-22	TipIce	Cassette C. Syringe 2. Same location.	14 36.060	144 46.578	526	11	13391
2:07	J800-BM1-C4-23	TipIce	Cassette C. Syringe 4. Same location.	14 36.060	144 46.578	526	11	13397

timeUTC	sample	site	comments	latitude	longitude	depth	hdg	vv
4:08	J800-BM1-B1-33	OldeIronSlide	Cassette B. Syringe 1. In flow above anemone. HFS temp=11.5C (ambient 7.1).	14 36.0563	144 46.656	567	317	13639
4:09	J800-BM1-B2-34	OldeIronSlide	Cassette B. Syringe 2. Same location.	14 36.0563	144 46.656	567	318	13642
4:11	J800-BM1-B4-35	OldeIronSlide	Cassette B. Syringe 4. Same location.	14 36.0563	144 46.656	567	319	13645
4:16	J800-BM1-B5-36	OldeIronSlide	Cassette B. Syringe 5. Same location. Pulled sample twice to fill.	14 36.0563	144 46.656	567	321	13650
4:18	J800-BM1-B6-37	OldeIronSlide	Cassette B. syringe 6. Moved slightly to large patch of material.	14 36.0563	144 46.656	567	11	13661
3:05	J801-BM1-D6-21	GoldenHorn top	Cassette D. Syringe 6. Normal syringe. Taken in flow at spire slightly below top of GoldenHorn. (Sampling after visit to elevator).	12 55.3431	143 38.9534	2923	176	14727
3:06	J801-BM1-D5-22	GoldenHorn top	Cassette D. Syringe 5. RNA later syringe. Same location.	12 55.3431	143 38.9534	2923	176	14733
3:07	J801-BM1-D1-23	GoldenHorn top	Cassette D. Syringe 1. RNA later syringe. Same location.	12 55.3431	143 38.9534	2923	176	14735
3:10	J801-BM1-D2-24	GoldenHorn top	Cassette D. Syringe 2. Normal syringe. Same location.	12 55.3431	143 38.9534	2923	176	14740
3:12	J801-BM1-D4-25	GoldenHorn top	Cassette D. Syringe 4. Normal syringe. Same location.	12 55.3431	143 38.9534	2923	176	14745
3:16	J801-BM1-D3-26	GoldenHorn top	Cassette D. Syringe 3. RNA later syringe. Same location. Very little sample obtained.	12 55.3431	143 38.9534	2923	176	14752
4:09	J801-BM1-X6-29	GoldenHorn base	Cassette X. Syringe 6. Lighter mats at top of fluffy mat area near the base of GoldenHorn with flow coming from two holes. Veil-like.	12 55.3431	143 38.9534	2929	146	14835
4:11	J801-BM1-X1-30	GoldenHorn base	Cassette X. Syringe 1. Same stuff.	12 55.3431	143 38.9534	2929	146	14841
4:12	J801-BM1-X2-31	GoldenHorn base	Cassette X. Syringe 2. Same place.	12 55.3431	143 38.9534	2929	146	14845
4:56	J801-BM1-X5-34	GoldenHorn middle	Cassette X. Syringe 5. Fluffy veil-like mat with mixture of textures.	12 55.3431	143 38.9534	2928	96	14920
4:57	J801-BM1-X4-35	GoldenHorn middle	Cassette X. Syringe 4. Same material and location..	12 55.3431	143 38.9534	2928	96	14924
4:59	J801-BM1-X3-36	GoldenHorn middle	Cassette X. Syringe 3. Same material and location.	12 55.3431	143 38.9534	2928	96	14929
18:28	J801-BM1-C1-01	GoldenHorn base	Cassette C. Syringe 1. Geochem filter. Pulling water just above mat. Temperature measured at 20.5C before sample.	12 55.3426	143 38.9555	2930	153	13901
18:32	J801-BM1-C2-02	GoldenHorn base	Cassette C. Syringe 2. Ferrozine in syringe. Same location as previous. Color change observed.	12 55.3426	143 38.9555	2930	153	13909
18:38	J801-BM1-B4-03	GoldenHorn base	Cassette B. Syringe 4. RNA later at same location on chimney as samples 1-2.	12 55.3426	143 38.9555	2930	153	13920
18:39	J801-BM1-B5-04	GoldenHorn base	Cassette B. Syringe 5. RNA later syringe. Same location.	12 55.3426	143 38.9555	2930	153	13923
18:40	J801-BM1-C6-05	GoldenHorn base	Cassette B. Syringe 6. RNA later syringe. Sample appears to have been pulled at the same time as Syringe 5 (sample-04).	12 55.3426	143 38.9555	2930	153	13927
20:01	J801-BM1-C5-09	GoldenHorn middle	Cassette C. Syringe 5. Geochem filter- water only. Position 2m higher on the chimney than the previous samples at the base. Jason sensor: Temp=27.5C.	12 55.3426	143 38.9555	2928	132	14068
20:06	J801-BM1-B2-10	GoldenHorn middle	Cassette B. Syringe 2. RNA Later sample. Same location. (Note syringe 1 started to pull prematurely at same time).	12 55.3426	143 38.9555	2928	132	14081

timeUTC	sample	site	comments	latitude	longitude	depth	hdg	vv
20:11	J801-BM1-B3-11	GoldenHorn middle	Cassette B. Syringe 3. RNA Later sample. Same location. Jason sensors: O2=127.6uM in sample site. Ambient O2=131.0uM.	12 55.3426	143 38.9555	2928	132	14089
21:13	J801-BM1-C4-14	GoldenHorn top	Cassette C. Syringe 4. Ferrozine syringe. Pulled just under 20mL. At chimney near top of GoldenHorn. Jason sensor: T=28.06C before sampling.	12 55.3426	143 38.9555	2922	167	14210
21:17	J801-BM1-C3-15	GoldenHorn top	Cassette C. Syringe 3. Geochem filter. Intake tip in flow.	12 55.3426	143 38.9555	2922	167	14219

4.1.1.3 Characterization of Vent-associated Protist Communities

Sheryl Murdock (University of Victoria)

In the decades since the discovery of hydrothermal vents biological investigations in these environments have been focused on either chemosynthetic prokaryotes (bacteria and archaea) or multicellular eukaryotes (macrofauna). Only recently have we begun to think about the unicellular eukaryotes (i.e. protists) that inhabit these environments. What role do they play in ecosystem functioning? How do they cope with the toxicity of the environment? How does the protozoan population respond to changing conditions in dynamic hydrothermal settings? What is the range of various protozoan groups with respect to the source of hydrothermal venting? Are there endemic hydrothermal populations of protists?

My participation in the 2014 Ironman/Submarine Ring of Fire cruise aimed to delve into all of these questions by assessing 18S rRNA gene diversity of bulk community DNA and RNA, isolating previously identified key organisms for single cell genome sequencing, quantifying the abundance of previously identified key groups in various vent and non-vent environments, and attempting to culture previously uncultured protist groups that were dominant in past samples from Mariana vents. This work was to build upon molecular analyses of samples from the 2004 and 2006 Submarine Ring of Fire cruises thus creating a time-series component to the study. The primary objectives were 1) time-series sampling at key vents on NW Rota-1 and NW Eifuku, 2) niche comparisons of protozoan communities (diffuse fluids, plume, mat, background seawater), and 3) sampling for cell sorting and single-cell genomics. Secondary objectives included 1) microscopic observations of protists from vent fluids, 2) collection of animals for parasite investigations, and 3) testing methods for culturing of vent protists.

Due to the series of unfortunate weather and equipment delays the sampling of vent fluids was not carried out in a manner that will be of much use for comparison to previous sampling years, thus the time-series aspect was not achieved. Additionally, the current state of NW Rota-1, which has significantly quieted down from previous samplings, left little opportunity for such time-series investigations in that location. DNA samples from weakly venting fluids with temperatures barely above ambient, and from smoky plumes in the area may provide an interesting opportunity to monitor changes in the protist community in the waters surrounding the now quiet volcano. Plume samples were also collected over the summits of Daikoku, which is now showing signs of intense eruptive activity, and over NW Eifuku. These three plume samples will be valuable in assessing whether subsurface microbes expelled with hydrothermal fluids act as an attractive food source luring in protist predators and linking the subsurface and deep-ocean food webs.

Subsamples of iron mats collected by the Moyer and Emerson groups were preserved for CARD-FISH, a microscopic probing technique that will allow visualization and enumeration of protist groups that have been previously identified as dominant members at the Mariana vents. Microbial mats may provide and excellent source of food and/or shelter for protists but this association has not yet been investigated. Samples were also preserved for CARD-FISH from tissues of shrimp, mussels, scale worms and limpet larvae to test the theory that dense communities of animals serve as habitats for parasitic protists in the hydrothermal vent environment.

By far, the most successful and surprising aspect of protist research on the cruise came from the culturing attempts. While this was not a primary objective and thought to be simply a first pass attempt, the results were very encouraging. Positive cultures resulted from inoculation with diffuse fluids, plume water, and water from within mat sampling devices. Cultures of recently hatched limpet larvae also produced biofilms that appeared to be comprised of protists. Three colonization devices borrowed from Pete Countway (Bigelow) were deployed for five days at NW Eifuku adjacent to 17-34°C diffuse fluids. Material from these devices also yielded positive cultures of what appear to be a fairly uncharacterized group of eukaryotes.

Samples of diffuse fluids and mats were collected for DNA from the Urashima vent area, which has not previously been investigated for protist diversity. This site is in the south near the junction of the volcanic arc and back arc and will add a new dimension to previous arc-scale samplings. Iron mats from this site will be used to test how the addition of iron influences the growth of protists in culture.

Table 4.4.1.3 Summary of Murdock Samples

Log sample #	Location	sample type	DNA	RNA	genomics	CARD-FISH	culturing	counts
J2-797-HFS-05	Marker 114, Snail vent area	Diffuse fluids		x				
J2-797-HFS-20	Marker 108, Snail vent area	Diffuse fluids			x	x	x	x
J2-797-HFS-38	Saipanda Horn, Urashima vent area	Diffuse fluids			x	x	x	x
J2-797-HFS-41	Saipanda Horn, Urashima vent area	Diffuse fluids	x					
J2-797-HFS-42	Saipanda Horn, Urashima vent area	Diffuse fluids		x				
J2-797-SS-44	Saipanda Horn, Urashima vent area	Water from suction jar, iron mat	x				x	
J2-797-LScoop2-45	Saipanda Horn, Urashima vent area	Iron mat		x				
J2-797-LScoop1-50	Snap Snap, Urashima vent area	Iron mat		x				
J2-798-HFS-01	Marker 144, (Champagne area), NW Eifuku	Diffuse fluids			x			x
J2-798-HFS-02	Marker 144, (Champagne area), NW Eifuku	Diffuse fluids	x					
J2-798-BM-B2-11	Marker 144, (Champagne area), NW Eifuku	Fluids from cassette, sulfur mat					x	
J2-798-BM-C1-17	Marker 146, Yellow Cone, NW Eifuku	Fluids from cassette, iron mat					x	
J2-798-BM-C4-19	Marker 146, Yellow Cone, NW Eifuku	Fluids from cassette, iron mat					x	
J2-798-BM-D1-25	Marker 124, Yellow Cone, NW Eifuku	Fluids from cassette, iron mat					x	
J2-798-HFS-31	Marker 124, Yellow Cone, NW Eifuku	Diffuse fluids			x	x	x	x
J2-798-Mbag-37	Razorback, NW Eifuku	Mussels				x		
J2-798-SS-38	Razorback, NW Eifuku	2 scale worms (Branchnotogluma)				x		
		1 gravid shrimp (Alvinicaris)				x		
V14B-06-6	Vertical cast NE of NW Eifuku, east of the arc front	Background water	x					
V14B-06-10		Background water at oxygen minimum	x					
T14B-03-11	Tow-yo line 750m N of the summit of Daikoku	Eruptive plume	x				x	x
T14B-03-17		Background water	x				x	x

Log sample #	Location	sample type	DNA	RNA	genomics	CARD-FISH	culturing	counts
T14B-04-5	Tow-yo line 300m W of the summit of Daikoku	Eruptive plume	x			x	x	x
T14B-04-14		Background water	x				x	x
J2-799-PrTrap104-01	Marker 124, Lower Yellow cone, NW Eifuku	in-situ enrichment	x		x	x	x	x
J2-799-BM1-D1-10	Marker 146, Upper Yellow Cone, NW Eifuku	Iron mat in flow				x		
J2-799-BM1-D6-18	Marker 146, Upper Yellow Cone, NW Eifuku	Reddish iron mat				x		
J2-799-BM1-D3-20	Marker 146, Upper Yellow Cone, NW Eifuku	Fluffy iron mat				x		
J2-799-BM1-B1-21	Upper Yellow Cone, near Marker 146	Soft iron mat				x		
J2-799-PrTrap113-27	Razorback, NW Eifuku	in-situ enrichment	x		x	x	x	x
J2-799-biogeo-28	Razorback, NW Eifuku	Rocks covered in limpet egg cases				x		
J2-799-ShrTrap-31&32	Razorback, NW Eifuku	4 shrimp (Alvinicaris)				x		
J2-799-HFS-33	Marker 144, (Champagne area), NW Eifuku	"Plume" in the area of Champagne	x					
J2-799-PrTrap4-35	Marker 144, (Champagne area), NW Eifuku	in-situ enrichment	x		x	x	x	x
J2-799-HFS-37	Champagne-Golden Lips, NW Eifuku	Fluid over mussels				x		
J2-799-Biomacro-38	Champagne-Golden Lips, NW Eifuku	Mussels				x		
V14B-10-6	2 point vertical cast over Eifuku, plumes of Champagne and Yellow Cone	Champagne plume	x					
V14B-10-10		Background water	x					
V14B-10-14		Yellow Cone plume	x					
J2-800-HFS-1	Phantom, NW Rota	Diffuse fluids			x			
J2-800-SS-8	Arrowhead, NW Rota	Alvinicaris (shrimp)	x	x		x		
J2-800-HFS-10	NW Rota (Styx to Charon, then Menagerie to TipIce)	Background/plume	x					
J2-800-HFS-11	Smokin' Stones, NW Rota	Diffuse fluids			x	x	x	x

Log sample #	Location	sample type	DNA	RNA	genomics	CARD-FISH	culturing	counts
J2-800-HFS-13	Smokin' Stones, NW Rota	Diffuse fluids	x					
J2-800-HFS-16	Menagerie, NW Rota	Diffuse fluids			x			
J2-800-HFS-18	Menagerie, NW Rota	Diffuse fluids	x					
J2-800-BM1-C1-21	TipIce, NW Rota	Iron mat				x		
J2-800-HFS-28	Crab Cavern, NW Rota	Diffuse fluids			x		x	
J2-800-BM1-B1-33	OldIronSlide, NW Rota	Iron mat				x		
J2-801-HFS-8	Golden Horn Spire (Base), Urashima vent area	Diffuse fluids	x					
J2-801-HFS-12	Golden Horn Spire (Middle), Urashima vent area	Diffuse fluids				x	x	x
J2-801-HFS-17	Golden Horn Spire (Top), Urashima vent area	Diffuse fluids			x		x	
J2-801-SS-27	Golden Horn Spire (Top), Urashima vent area	Iron mat						
J2-801-BM1-X6-29	Golden Horn Spire (Base), Urashima vent area	Iron mat				x		
J2-801-BM1-X5-34	Golden Horn Spire (Middle), Urashima vent area	Iron mat				x		
J2-801-HFS-37	Golden Horn Spire (Top), Urashima vent area	Diffuse fluids	x					
J2-801-HFS-43	"Active Chimney" shrimp area, Urashima vent area	Diffuse fluids				x	x	x

4.1.1.4 Rock Microbiology/Vent Biogeochemistry

Jason Sylvan (University of Southern California)

The purpose of rock sampling on this cruise was to study microbial populations on low temperature sulfide structures and on basement rock and to determine how mineralogy influences microbial communities on these structures. In particular, previous work studying microbes on basaltic andesite from Mariner vent field in Lau Basin indicated that microbial communities on this substrate are quite different from the more commonly sampled and studied basalts found at mid-ocean spreading ridges. Therefore, the goal for this cruise was to collect as many basement rock and sulfide structures as possible and to co-sample them for microbiology and mineralogy.

The vent biogeochemistry Sylvan sampled for was to measure dissolved organic nitrogen (DON) in diffuse flow vents and determine the species of DON present. Additionally, incubations were conducted to determine rates of uptake for ammonia, nitrate and dissolved amino acids, a type of DON, by adding ^{15}N labeled substrates and measuring the amount that is incorporated into biomass over time. This was also conducted with select CTD samples from TowYos and vertical casts.

Summary of Rock Sampling

1. Sampling Methods

During RR1314, rock samples were collected with the ROV Jason II using one of the arms to grab the rock at the seafloor. Once in the vehicle's claw, the rocks were placed in bioboxes and the bioboxes closed until surfacing. Two exceptions to this are the samples J2-801-R1-oFe, -oS and -in, all of which were part of the same sulfide chimney that fell onto the vehicle's basket while sampling and came up unsealed in a biobox, and J2-801-R?, which fell into the starboard swing arm milk crate that holds the Major samples while putting the Major sampler away. This sample also came up unsealed. In addition to the samples collected with the arms of the ROV, rock rubble was collected from two scoops (J2-800-Scoop8 and S2-800-LScoop-2) and one slurp sample (J2-801-SS) after the microbial mat material had been removed from above it.

Once on the ship, samples were processed in a flame sterilized rock box with flame sterilized chisels. Sylvan wore gloves, a lab coat and a respiratory mask while sampling. Rock chips were removed from the rocks and placed in containers for DNA (placed in 50 ml centrifuge tube and frozen), RNA (placed in 50 ml centrifuge tube with RNAlater, sat at 4˚C for a day and then frozen), cell counts (placed in 15 ml centrifuge tube with 2.5% gluteraldehyde and stored at 4˚C), single cell genomics (placed in 10%Glycerol/90%ASW solution in 15 ml centrifuge tube) or used for culturing (a slurry was made using rock chips and filtered seawater and then added to media targeting growth of sulfur oxidizers and/or nitrate reducers and then incubated at 4˚C). During

2. Shipboard analysis

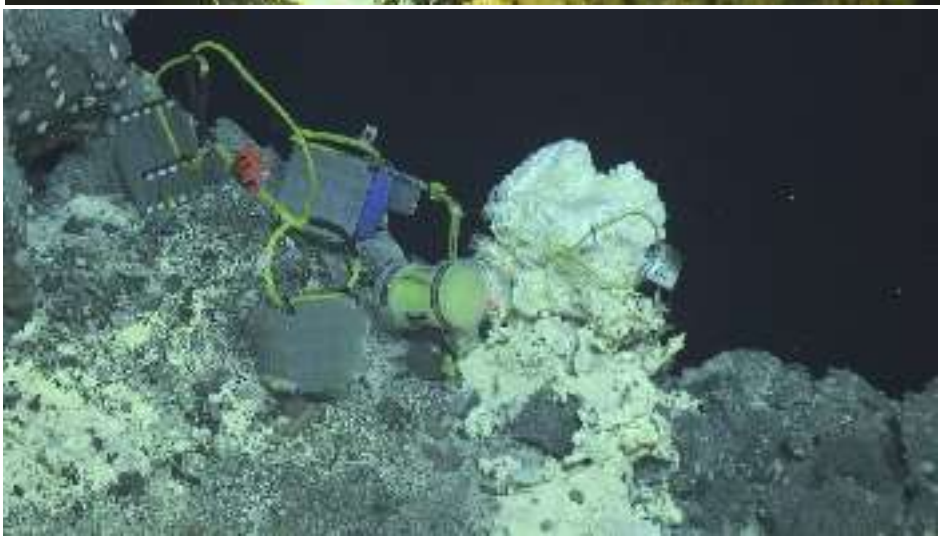
No analyses were conducted on board the Revelle, these will all be done post-cruise.

3. Sampling summary

Due to the limited dive time, rock sampling was somewhat limited. Two sets of samples were collected - a set of sulfides with Fe-oxide layers on the outside, collected from Urashima site during dives J2-797 and J2-801, and a set of seafloor exposed silicates, likely basaltic andesite, collected from NW Eifuku during dive J2-799 and NW Rota during dive J2-800.

4. Rock Descriptions and images

J2-797-Sulfide-52
Sulfide with Fe-oxide coating on most of it but with grey sulfide poking through in places, likely the inner part of the sample (inner sulfide chimney with thick outer layer of Fe-oxide). Could see some very small conduits poking through the Fe-oxide parts.



J2-799-R1 (aka J799-Biogeo-28)
Silicate that was embedded in a sulfur chimney. Chimney part was super friable and fell apart during sampling with the ROV. Likely composed of sulfur. Some bits left on rock, they were yellow-white. Rock itself is dark grey with some oxide staining, silicates on this seamount are basaltic to andesitic so will have to analyze elemental composition to tell.

J2-800-R1
Black, glassy silicate. Friable (easily split with chisel, crumbly, but not falling apart with just touching) with no visible olivine. Possibly basaltic andesite.

J2-800-R2
Silicate, lots of limpet egg cases. Outer layer about, 1 cm thick (J2-800-R2out), had all the limpet egg casings and is similar in features to the other outer layers from J2-800-R3, but an inner layer (J2-800-R2in) did not. Inner layer has some clearish parts, looked similar to anhydrite but not sure what it is.

J2-800-R3
Silicate, black, not much olivine, rusty colored in spots, possible oxide staining. Friable (easily split with chisel, crumbly, but not falling apart with just touching), with many barnacles, appears porous.

J2-800-R3a
Same collection spot as J2-800-R3, but when split this rock had a light grey rock on the inside. Outside (J2-800-R3a-out) is glassy and appears to be same flow as J2-800-R3, but inside (J2-800-R3a-in) is an older flow or xenolith that was overrun by the newer basalt flow.

J2-800-R3b
Same flow as J2-800-R3 and -R3a-out. This rock had streamers on the outside, possibly e-proteobacterial sulfur oxidizers.

J2-801-R1
Sulfide, could not tell if active or inactive at the time of sampling. Collected from the very top of Shar-pen chimney. Had Fe-oxide outer coating (J2-801-R1-oFe), underlain by a grey sulfide layer (J2-801-R1-oS). The inner conduit (J2-801-R1-in) was grey sulfide mixed with pyrite, you could see pathways for fluid flow at one point, and the pyrite as well as the flow paths indicate it was active at some point. Somewhat friable, but not crumbly.

J2-801-R?
Sulfide, looks similar to J2-797-Sulfide-52. Thick outer layer of Fe-oxides with a bit of grey material on inside, likely sulfide. (Sample was found in the basket after the dive, not officially logged. Speculated that the material fell into the basket when Jason dislodged sulfides at 12/18 04:32:57 when this photo was taken between samples J801 BBScoop-32 & Major-33).

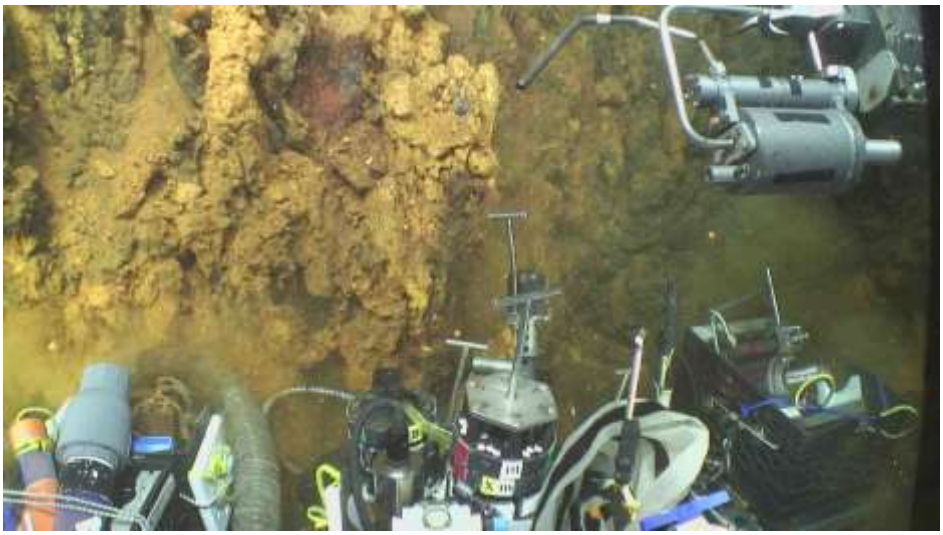


Table 4.1.1.4-1 - Rock samples sorted by Location

sample	site	Depth (m)	Virtual Van EVT #	day collected	temp (deg. C)	comment
J2-800-R3	Barnacles	567	13459	17-Dec-14	7˚C	
J2-800-R3a-out	Barnacles	567	13459	17-Dec-14	7˚C	
J2-800-R3a-in	Barnacles	567	13459	17-Dec-14	7˚C	
J2-800-R3b	Barnacles	567	13459	17-Dec-14	7˚C	
J2-801-R? *	base of Golden Horn	2930	*	18-Dec-14		looks similar to J2-797-Sulfide-52
J2-800-Scoop8	Olde Iron Slides	567	13673	17-Dec-14	7˚C	from Scoop sample; after mat settled, Sean pulled mat off top and gave me material at bottom, mostly rubble, Fe-oxide coated silicates. Looks similar to other NW Rota rocks
J2-800-R1	Phantom	554	12875	17-Dec-14	7˚C	Virtual Van label J800-biogeo-2
J2-800-R1p2	Phantom	554	12875	17-Dec-14	7˚C	Virtual Van label J800-biogeo-2; same sample as J2-800-R1, but different part of rock
J2-799-R1	Razorback	1566	12395	14-Dec-14	3˚C	Virtual Van label J799-Biogeo-28
J2-797-Sulfide-52	Shar-Pen	2928	2969	30-Nov-14	~2˚C	
J2-800-R2out	Smoking Stones	599	13134	17-Dec-14	7˚C	Virtual Van label J800-biogeo-15
J2-800-R2in	Smoking Stones	599	13134	17-Dec-14	7˚C	Virtual Van label J800-biogeo-15
J2-800-Lscoop-2	TipIce	527	13344	17-Dec-14	7.9˚C	from Scoop sample; after mat settled, Craig pulled mat off top and gave me material at bottom, mostly rubble. was already in RNAlater, so no untreated sample for this one
J2-801-SS	top of Golden Horn	2923	14768	18-Dec-14		big, rocky chunks from slurp sample
J2-801-R1	top of Shar-pen	2928	15103	18-Dec-14		VV ID J801-rock-45
J2-801-R1-oFe	top of Shar-pen	2928	15103	18-Dec-14		VV ID J801-rock-45
J2-801-R1-oS	top of Shar-pen	2928	15103	18-Dec-14		VV ID J801-rock-45
J2-801-R1-in	top of Shar-pen	2928	15103	18-Dec-14		VV ID J801-rock-45

*probably while J2-801-Major-33 (MS-Black) was being collected

Summary of fluid and hydrothermal plume sampling

1. Sampling methods

Hydrothermal vent fluids were collected for DON analysis using the titanium Major samplers because these are less likely to be contaminated by DOC than the plastic samplers used by the beast. Two exceptions are J2-799-HFS-P1, collected with the piston sampler, and J2-801-HFS-24, which was a background water sample collected with a bag sample on the hot fluids sampler. All samples were filtered with 0.2 μm syringe tip filters (25 mm diameter), except the two HFS samples, which were filtered with 0.2 μm filters at the time of collection on the beast. Vent fluid samples were collected in acid washed polycarbonate bottles, acidified with 2 ml concentrated HCl per L of sample, placed in a sample bag and frozen.

Hydrothermal plume samples were collected for DON analysis using the Niskin rosette employed by the plume team (Resing et al). These were filtered with 0.2 μm syringe tip filters and placed in a sample bag and frozen. They were not acidified because the plumes had much lower Fe concentrations than the vent fluids, so will not be a problem later (the Fe messed with previous results).

Incubations were conducted to determine uptake rates for nitrate, ammonia and amino acids from 6 samples, 3 hydrothermal plume samples and 3 vent fluid samples. These were conducted by adding ~10% concentration of in situ values for each substrate of ^{15}N labeled substrates. Incubations were stopped 16-24 hours later by filtering samples into silver chloride 0.2 μm filters and collecting the filtrate for regeneration and quantification.

2. Shipboard analysis

No analyses were conducted on board the Revelle, these will all be done post-cruise.

3. Sampling summary

An effort was made to collect at least one hydrothermal fluid sample for DON analysis from each dive and this was successful, with most dives yielding 2 samples. After dive J2-798, when there was a pause in dives due to technical problems and bad weather, hydrothermal plumes were sampled. For the TowYos and vertical casts, an effort was made to collect a few samples from in the plume and one below plume background sample from each cast. Of particular interest, in plume samples from right over Daikoku were sampled during cast T14B-04.

Table 4.1.1.4-2 - DON samples by location

	site	Depth (m)	Virtual Van EVT #	day collected	temp (deg. C)	N uptake assay?	Cell Counts	Comment
J2-798 - NW Eifuku								
J2-798-MS-Black	Yellow Cone	1584	5474	6-Dec-14	24˚C	NH4 (125 ml) + DPA (50 ml)	no	pH 5.36 (VV ID J2-798-Mjr-black)
CTD T14B-02 - TowYo over Eifuku volcano								
bottle 3 (b3)	Eifuku TowYo	385	---	9-Dec-14		no	yes	just south of summit, in plume
bottle 5 (b5)	Eifuku TowYo	384	---	9-Dec-14		NH4 (250 ml) + NO3 (250 ml) + DPA (250 ml)	yes	southern portion of summit, in plume, strongest particle signal
bottle 12 (b12)	Eifuku TowYo	522	---	9-Dec-14		no	yes	below plume background
CTD T14B-03 - TowYo SW->NW ~750 m north of Daikoku Summit								
bottle 8 (b8)	Daikoku TowYo	430	---	12-Dec-14	12	no	yes	a little NW of summit
bottle 10 (b10)	Daikoku TowYo	360	---	12-Dec-14	14	NH4 (250 ml) + NO3 (250 ml) + DPA (250 ml)	yes	direct in plume, N of summit, strong ORP
bottle 11 (b11)	Daikoku TowYo	358	---	12-Dec-14	14	no	yes	direct in plume, N of summit, strong ORP, LSS 0.34
bottle 17 (b17)	Daikoku TowYo	500	---	12-Dec-14	8.7	no	yes	below plume background
CTD T14B-04 - TowYo N->S ~300 m west of Daikoku summit								
bottle 4 (b4)	Daikoku TowYo	382	---	13-Dec-14	14.4˚C		yes	
bottle 5 (b5)	Daikoku TowYo	384	---	13-Dec-14	14.4˚C	NH4 (250 ml) + NO3 (250 ml) + DPA (250 ml)	yes	
bottle 6 or 7 (b6 or b7)	Daikoku TowYo	375	---	13-Dec-14	~14.5˚C		yes	
bottle 8 (b8)	Daikoku TowYo	370	---	13-Dec-14	14.6˚C		yes	

	site	Depth (m)	Virtual Van EVT #	day collected	temp (deg. C)	N uptake assay?	Cell Counts	Comment
bottle 14 (b14)	Daikoku TowYo	678	---	13-Dec-14	?		yes	
bottle 16 (b16)	Daikoku TowYo	504	---	13-Dec-14	~9˚C		yes	
J2-799 - NW Eifuku								
J2-799-P1	diffuse venting at Yellow Cone, different spot than J2-798-MS-black	1580	12087	14-Dec-14	30-33˚C	no	no	pH 5.21
CTD T14V-10 - vertical cast over NW Eifuku								
bottle 15 (b15)	<10 m over Yellow Cone site (plume)	1576	---	14-Dec-14	3˚C	no	yes	high LSS, low ORP for this sample
J2-800 - NW Rota								
J2-800-MS-Red	Brimstone	543	12989	17-Dec-14	102˚C	no	no	10 mM sulfide - will stink upon thawing
J2-800-MS-White	Crab Cavern	565	13582	17-Dec-14	10˚C	DPA (140 ml)	no	ambient background here is 7˚C, Virtual Van ID J800-Major-31
J2-801 - Urashima								
J2-801-MS-Red	"Active Chimney," likely Ultra-no-chichi	2929	15020	18-Dec-14	174˚C	no	no	low sulfide, same site as J2-801-HFS-Pistons#2&3
J2-801-MS-Black	base of Golden Horn	2930	14897	18-Dec-14	74˚C	DPA (160 ml)	no	

	site	Depth (m)	Virtual Van EVT #	day collected	temp (deg. C)	N uptake assay?	Cell Counts	Comment
J2-801-HFS-24	background as vehicle was rising	2375-2262	15138	18-Dec-14	2.1 ˚C	no	no	virtual van ID J801-HFS-48

4.1.1.5 Microbiology – Dr. Clara Chan Lab

Sean M. McAllister, PhD Student, University of Delaware

Cruise summary:

The Dr. Clara Chan lab was successful in its science objectives, focusing on the biogeochemistry of Fe oxide mats at several hydrothermal vent sites. We collected sample, preserving in situ RNA expression at three sites on Golden Horn chimney, Urashima, with thorough geochemistry collected at the same locations. With the help of Jason Sylvan, Anna Leavitt, and others, five Fe(II) addition experiments from fresh mat were completed onboard to assess Fe(II) oxidation activity; a subset of these samples will be used for metatranscriptomics experiments. The Chan lab conducted Fe(II) and total Fe analyses on select geochemistry (hot fluid sampler and CTD) samples from the cruise. In addition to providing Fe concentrations associated with microbial mat samples, these data helped to show the variable Fe conditions at NW Rota-1 and detectible Fe within the plume of the actively erupting Daikoku seamount.

Cruise objectives and sampling outcomes:

1. *In situ* mat sampling with corresponding geochemistry
   Three distinct samples were collected from the Golden Horn Chimney (bottom, middle, top), with two to three replicates each. These were paired with thorough collection of geochemistry data (see Table 1 for summary of key data and corresponding sample numbers).

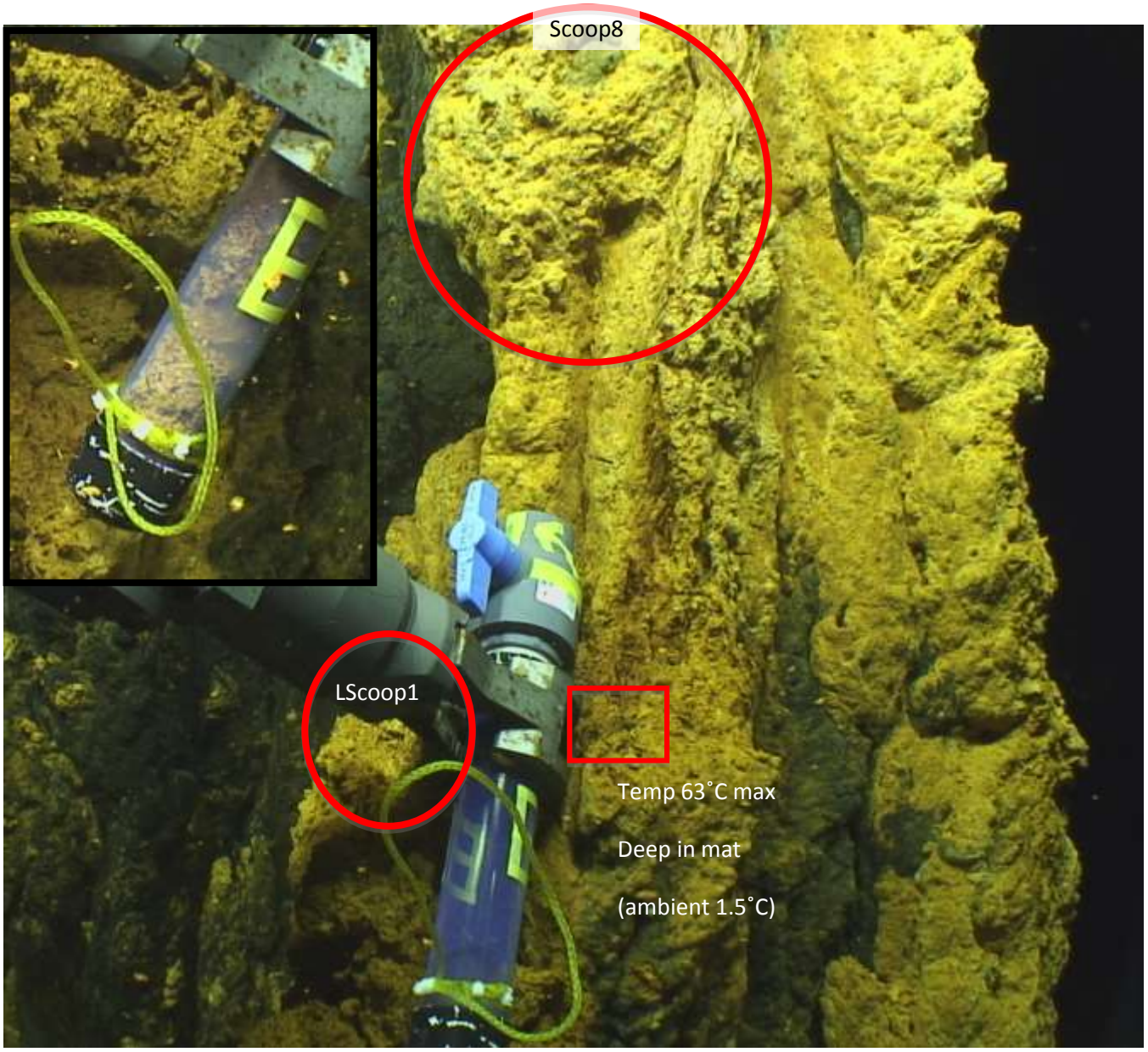
2. Fe(II) addition experiments
   Four bulk samples were collected for use in Fe(II) addition experiments. One sample in particular, collected from the middle of the Golden Horn Chimney, shows promise for downstream analysis by metatranscriptomics (J2-801-scoop8; collection shown in Figure 1).

3. Fe analyses

We analyzed 41 individual samples for Fe(II) and total Fe, filtered and unfiltered. 28 were from the HFS bag and piston samplers; 4 from Major samplers; 4 from geochemistry syringes on the Biomat Sampler; 5 from CTD-T04 over Daikoku. All biomat sampler samples were filtered in situ. Samples for the ferrozine assay were transferred 1:1 into a 80 mM sulfamic acid solution to stabilize the Fe(II) concentration before measuring with the standard ferrozine assay.

Table 4.1.1.5-1. Golden Horn Chimney sampling summary.					
	units	**Base**	**Middle**	**Top**	**Data source**
Mat texture/type		veil	veil	curd/chimlet	visual
Temperature	˚C	20.5	*27*	17	High-T wand
pH		5.68*	*5.9**		HFS
O_2 ambient	µM	132-162	131		O_2 probe
O_2 mat surface	µM	80	128		O_2 probe
O_2 1 cm in mat	µM	52	123		O_2 probe
O_2 HFS	µM	108	*108*	89	HFS
Fe(II) dissolved	µM	163	0.94	116	Cassette C syringes with filters
Fe total dissolved	µM	171	7.6	122	Cassette C syringes with filters
Sample numbers					
RNA samples		B45, B6	B23	D135	
Other mat samples		*X126, BBscoop1*	*X345, LScoop1, Scoop8*	*D246, LScoop4, SS*	
Filtered BM Geochem		C1	C5	C3	
in situ ferrozine samples		C2	none	C4	
HFS sample		B17, BF18, *Sterivex13*	*B19, BF20*	P7, PF8, Sterivex*10*/14	
Major sampler		Black			
Virtual Van reference		13898	14068	14210	
italics= sampling from different location than RNA preservation					
*Reassess after calibration of pH data					

Figure 4.1.1.5-1. Sample collection for J2-801-scoop8-20 (12/17/14 22:48 UTC), of primary interest for the Fe(II) addition experiments. From the middle of the Golden Horn Chimney, in the Urashima vent field.



4.1.2 Macrobiology

Shawn Arellano (Western Washington University)
Verena Tunnicliffe (University of Victoria)

Table 4.1.2-1 Macrobiology Sample List:

Dive	Volcano	UTC	sample	site	Sample	latitude	longitude	Z	notes
J2- 798	NW Eifuku	2:39	J798-Mbag-37	Razorback	Scoop of mussels.	21 29.2502	144 2.5086	1561	pH = 7.2
J2- 799	NW Eifuku	18:32	J799-Biogeo-28	Razorback	Rock with Shinkailepas sp. egg cases	21 29.2458	144 2.5074	1566	Ambient T= 2.73; collected near J799-SPlate4-26
J2- 799	NW Eifuku	18:49 18:56	J799-Bio-31 & J799-Bio-32	Razorback	Moyer Shrimp Traps 4 & 3 (both full)	21 29.2434	144 2.4938	1561	
J2- 799	NW Eifuku	19:39	J799-biomacro-36	Champagne - Mkr144	Mussels scooped from rocks above a white deposits.	21 29.2498	144 2.4857	1608	HFS sensors: pH~5.2. Start 19:39. Stop 19:4
J2- 799	NW Eifuku	19:53	J799-biomacro-38	GoldenLips	Scoop of mussels.	21 29.2567	144 2.4813	1606	NW of previous sample on small ridge. Tmax=2.7 Tavg=2.7 HFS sensor: pH=5.78.
J2-800	NW Rota	21:48	J800-biogeo-02	Phantom	Rock with limpets and egg cases	14 36.052	144 46.514	554	
J2-800	NW Rota	22:36	J800-SS-08	Arrowhead (Brimstone)	Shrimp suction	14 36.058	144 46.535	544	
J2-800	NW Rota	23:53	J800-biogeo-15	Smoking Stones-14	Rock with limpets and egg cases	14.6005719	144.77616	590	
J2-800	NW Rota	2:45	J800-biogeo-24 thru 27	Barnacles	Rocks with barnacles	14 36.0629	144 46.6324	567	at Barnacles marker.

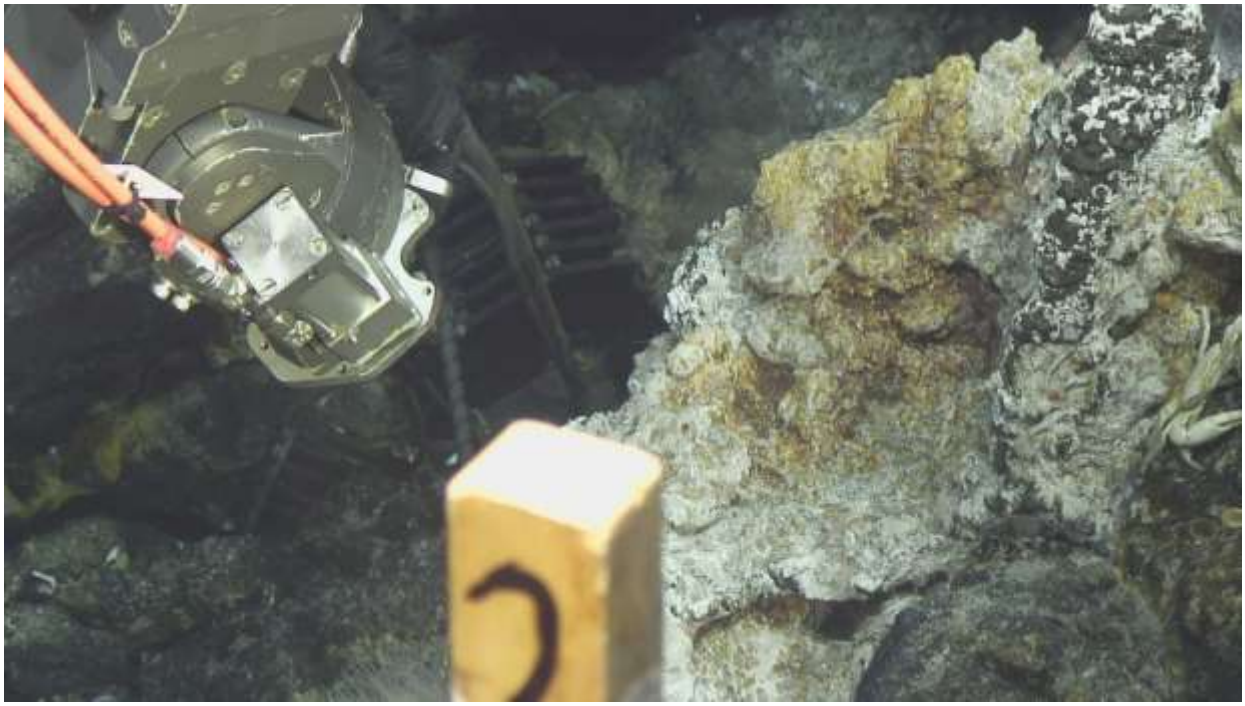
Description

Snail Vent, southern Mariana Backarc

A long dive (J2-797) was conducted at Fryer site (around Snail Vent) on the southern Mariana backarc. We landed very near Snail Vent, where we were tasked to recover two settlement plates for S. Beaulieu (WHOI) that were placed there in 2010. The area appeared to have some activity since the Beaulieu dives (with JAMSTEC) because only one of the sets of settle plates was found; the other was completely buried by fallen rock. A nearby JAMSTEC marker was also covered with fallen rock and the Beaulieu plates that we could recover were completely blackened.

Snail vent had areas of dense macrofauna, including *Phymorhynchus* snails, *Shinkailepas* limpets, *Alvinoconcha* snails, barnacles, crabs (both *Gandolfus* and galatheids), shrimp (*Alvinocaris*), and anemones were scattered all around.

A photomosaic survey of Snail Vent (centered over Stace5 target) was taken to document the fauna. The focus of work at the Fryer Site around Snail vent (Mkr 108, Saipanda Horn, Snap Snap) was microbiology and no macrobiology samples were collected, however there were a few observations of *Gandolfus* crabs on the microbial mats.



NW Eifuku, northern Mariana Arc

The two dives on NW Eifuku circumnavigated the biological activity on the summit. While we did not see the central mussel mass, there did not appear to be major changes in the overall extent and condition of the animal communities. We were more aware of small mussels on the periphery of the field on this trip indicating that recruitment continues to replenish the population. We observed a small bright red shrimp (in iron mats) and shells of a vesicomyid clam that were not previously recorded from NW Eifuku but there was no occasion to sample. Shrimp and galatheid crabs remain the most abundant mobile fauna of this vent community.

The main sampling effort was directed to the mussels. Our study (Rossi & Tunnicliffe, UVic) is to examine how high CO_2/low pH conditions affect the health and reproductive condition of these animals. We retrieved a total of 100 mussels from three collections in pH levels of 7.2, 5, 8 and 5.2. These animals were preserved for several studies: population genetics, symbiont abundance, reproductive condition, tissue health, and shell condition.

NW Rota, southern Mariana Arc

A short dive on NW Rota revealed a marked change in the extent of the animal community apparently as a response to reduced volcanic activity. There were only a few spots of discrete venting but the distributed populations of several species indicate a low level of seepage over much of the summit with the exception of the eastern ridge where previous shrimp colonies were now replaced by abundant barnacles. Notable was the great increase in numbers and egg cases of *Shinkailepas* – the large limpet – compared to our observations in 2010. This species has undergone expansion and retraction over the years of observation; this year, it was occupying the area of Phantom to Brimstone previously dominated by volcanic activity. The shrimp *Opaepele loihi* remains the dominant animal in the community; we collected one sample of ~250 shrimp to continue our time-series of size structure and reproductive condition. The final sampling effort targeted the barnacles now abundant on at “Fault Shrimp”; these animals are of acute interest to systematists who are testing barnacle evolution patterns using this new species of *Neoverruca*.

4.2 Chemistry-

4.2.1 Summary of Fluid Chemistry Goals and Accomplishments

Dave Butterfield (NOAA/PMEL/EOI UW JISAO)

The PMEL fluid chemistry group came into this research cruise with four broad goals. The first was to conduct a detailed study of the chemical environment around the NW Eifuku mussel communities, in order to establish a more accurate measure of the mean and extreme range of fluid chemistry experienced by the mussels. We are interested in both carbonate mineral saturation states for shell formation and the availability of hydrothermal energy sources, such as hydrogen sulfide. Our intention was to collect as many samples as possible in close proximity to mussel communities and tie the chemistry to observations of mussel density and biological measurements of mussel status and growth rates to be determined by Verena Tunnicliffe's lab. We also wanted to use the sensors on the HFS to map chemical properties near the seafloor and in the overlying plume. We had some success with this goal, but were severely limited by dive time available to collect fluid samples and conduct the sensor measurements. We collected sensor data near the seafloor to cover a substantial portion of the area inhabited by mussels, and we have plume data at approximately 50 m above the seafloor for the western part of NW Eifuku summit collected during the truncated ROV-mounted multibeam sonar survey. We collected a good representative set of samples from the Champagne vent area, generally staying away from sites with intense CO2 droplet concentration. We did not sample the CO2 droplets because it was not the top priority, and we didn't complete the higher priority sampling. We also collected a number of samples from the Yellow Cone site. Mussel sampling and associated fluid sampling was limited to two sites, Razor Back on top of the ridge above Champagne, and GoldenLips to the west of Champagne. Overall, we have enough to confirm the results of the 2004 sampling, but probably not enough to do a detailed study of the effect of the chemical environment on mussel ecology.

Our second goal was to revisit NW Rota and conduct time-series sampling of the hydrothermal system there. Although our dive there was relatively short, we completed a transect that covered the main venting areas seen on earlier visits to NW Rota, and collected a good set of fluid samples. NW Rota stopped erupting prior to our visit, giving us a view of how the hydrothermal system evolves as the volcano goes from eruptive to dormant. This was visually quite interesting, for example seeing areas that were formerly completely covered with white mat now in a state of transition to orange mat. We expect interesting chemical results from the samples as well. (Our samples are still in transit in the container as this report is being compiled, so we have no lab results yet).

Our third major goal for vent fluid chemistry was to collaborate with other scientists on board to support the primary NSF-supported goal of studying the biogeochemistry of iron mats around hydrothermal vents. Part of this goal was satisfied by taking coordinated samples with the HFS, major samplers, and gas-tight samplers whenever possible, and that aspect of the cruise was quite successful. Our samplers are designed to sample where there is visible flow and require an adequate flow to work well. The most active mat sites were usually the desired target for iron biogeochemistry work, so this worked out reasonably well. We also tried to collect high-temperature fluids, since they are essential to understanding chemical reactions in the vent environment. We should have a set of samples that will allow us at least to characterize the fluid composition for most relevant constituents (e.g. pH, dissolved iron and other metals, dissolved gases, silica, etc.). We also used the in-situ filtration capability of HFS to concentrate suspended particles for analysis of DNA/RNA from the same sites where chemistry samples were taken. All of this data will help to interpret the data generated by the Moyer and Emerson labs. We made every effort to help get samples for all investigators on board whenever we could (e.g. RNA-preserved or Sterivex filters, portions of HFS or major samplers). We will be analyzing fluid chemistry on a few syringe samples that were taken specifically for biogeochemistry, in collaboration with Sean McAllister. Likewise, Sean analyzed iron (dissolved/total) in some of the HFS samples that we collected. We will be sharing data as it becomes available in the next few months.

Our fourth goal was to measure hydrothermal tracers in the water column to contribute to our understanding of the nature of hydrothermal sources and their impact on the water column. To this end, we sampled nearly all of the Niskin samples taken with the CTD rosette for shipboard gas chromatographic analysis of dissolved hydrogen and methane. In a few cases, we also measured hydrogen sulfide from Niskin samples. We also used the pH and oxygen sensors on HFS to measure water column properties during transects and ROV ascent/descent, as mentioned above in the description of work at Eifuku.

Over the course of the cruise, we collected 55 successful fluid chemistry samples with HFS and titanium major samplers during the five dives completed. In addition, 13 gas-tight samples were collected and processed on board. For collection of microbial material carried by the fluids, we collected 9 Sterivex cartridge filters and 7 47mm flat filters with passive RNA-Later preservation.

Personnel

Dave Butterfield worked on sampler preparation, sample processing and analysis of pH and alkalinity.

Leigh Evans prepared and processed all gas-tight samples.

Ben Larson analyzed vent fluid and CTD-Niskin samples for dissolved hydrogen and methane by gas chromatography.

Kevin Roe worked on sampler preparation, sample processing, and analysis of ammonia, dissolved silica, and hydrogen sulfide.

Sampling and Analytical Methods Description

We include here some details of the methods used to collect and process fluid samples. We used titanium major samplers provided by WHOI throughout the cruise. Prior to each use, the samplers were rinsed, degreased with Saf-Sol spray solvent and lint-free wipes, rinsed again, lubricated with a small amount of Fluorolube grease, cocked and dead volume was filled with a few mL of 0.2 micron-filtered deep seawater collected during the cruise with a Niskin sampler. (This same filtered deep seawater was used to fill the dead volumes of the HFS). [Note that one of the new titanium samplers from WHOI was severely corroded and was not used].

The Hydrothermal Fluid and Particle Sampler was used on every dive. The configuration changed over the course of the dives, as will be described. The top rack of HFS held the piston samplers, in positions 1-8 for the first two dives, and in 1-9 for the final 3 dives. Valve position 12 was always occupied by the SBE63 Oxygen Optode and the AMT deep-sea pH sensor. Position 9 initially had a Sterivex filter, but was switched to take a piston sampler on dive 799, when we eliminated the RNA-Later preservative filters and replaced them with Sterivex filters. Even-numbered piston and bag-type water samplers were filtered. Filters used were acid-cleaned, pre-weighed, 0.2 micron pore size, 47mm polycarbonate membrane filters. We took extreme precautions to prevent RNA-Later (near-saturated ammonium sulfate preservative held in reservoirs within the filter holder) from contaminating water samples. In spite of that, 6 water samples from the first two dives had shipboard ammonia above 100 µM, indicating contamination. At that point, we decided to remove the RNA-Later-containing filter holders and replace them with Sterivex filters.

Table 4.2.1-1. Hydrothermal Fluid Sampler fluid sample list. (Gas samples obtained with HFS sampler, GTHFS, are list in section 4.2.2)

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
11-30	9:16	J797-HFS-02	J2_797BF24	Mkr 114a site	Filtered bag #24. Tmax=16.7C; Tavg=10; T2=7; Vol=550mL. Area of yellow stained pillows and lava blocks. Background sensors: pH=3.693v; O2=280ml/L.	12 57.135	143 37.159	2845	1	564
11-30	9:20	J797-HFS-03	J2_797B23	Mkr 114a site	Unfiltered bag #23. Tmax=17.5; Tavg=16.0; T2=0; Vol=550mL. Same spot as sample 2.	12 57.135	143 37.159	2845	1	578
11-30	9:21	J797-HFS-04	J2_797RNA16	Mkr 114a site	RNA filter #16. Start 0921. Tmax=21.5; Tavg=13.8; T2=7; Vol=3000mL.	12 57.135	143 37.159	2845	1	591
11-30	9:41	J797-HFS-05	J2_797RNA15	Mkr 114a site	RNA filter #15. Tmax=21.0; Tavg=14.2; T2=8; Vol=3000mL. Stop 20:01.	12 57.135	143 37.159	2845	1	598
11-30	12:40	J797-HFS-19	J2_797B17	Mkr 108 site	Unfiltered bag # 17. Tmax=26; T2=12.3; tavg=34.9; Vol=550mL. Stop 1244 (in area of samples 13-15). Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	310	862
11-30	13:07	J797-HFS-20	J2_797P1	Mkr 108 site	Unfiltered piston #1. Start 1302. Stop 1306. Tmax=29.6; Tavg=28.5; T2=8; Vol=603mL. (in area of samples 7-12)	12 57.166	143 37.142	2850	334	897
11-30	13:15	J797-HFS-21	J2_797P3	Mkr 108 site	Unfiltered piston #3. Start 1311. Stop 1315. Tmax=56.9; Tavg=51.9; T2=6.2 Vol=602ml. (Same area as sample 20 but in 60C water like samples 7-12)	12 57.166	143 37.142	2850	338	908
11-30	16:17	J797-HFS-22	J2_797PF2	Mkr 108 site	Filtered Piston #2. Start=16:14:40. Stop=16:16:57. Tmax=182.6C Tavg=162.8C T2=41.2C Vol=478mL (On top of Mrk24 bucket lid; high temp flow surrounded by sulfur mats and shrimp.)	12 57.187	143 37.160	2847	347	1239
11-30	16:18	J797-HFS-23	J2_797P5	Mkr 24	Unfiltered Piston #5. Start= 16:18:21. Stop=16:21:21. Tmax=191.5C; Tavg=175.0C; T2=46C; Vol=473mL. (same location)	12 57.187	143 37.160	2847	347	1253
11-30	16:30	J797-Major-25	J2_797MW	Mkr 24	White Major. (same location)	12 57.187	143 37.160	2847	347	1278
11-30	16:36	J797-Major-26	J2_797MR	Mkr 24	Red Major. (same location)	12 57.187	143 37.160	2847	347	1288

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
12-01	5:01	J797-HFS-29	J2_797PF4	Baltan	Filtered piston #4. Start 05:01:50. Stop: 5:05:31. Tmax=169.3C; Tavg=163C; T2=51C; Vol=550mL. (High flow area; iron mat and sulfur with macrobio around; first called ""Active Chimney"")	12 55.340	143 30.951	2929	122	2310
12-01	5:06	J797-HFS-30	J2_797P7	Baltan	Unfiltered piston #.7 Start 05:06:41. Stop: 05:10:18. Tmax=160.9C; Tavg=158C; T2=50C; Vol=550mL. (same location)	12 55.340	143 30.951	2929	122	2322
12-01	5:15	J797-HFS-32	J2_797PF6	Baltan	Filtered piston #6. Start: 5:15:36. Stop: 5:19:17. Tmax=161C; Tavg=159C; T2=50C; Vol=530mL. (same location)	12 55.340	143 30.951	2929	122	2343
12-01	7:24	J797-HFS-38	J2_797B21	Saipanda Horn	Unfiltered Bag 21. Start 07:20. Stop 07:24. Tmax=19; Tavg=16.9; T2=7; Vol= 525mL. Same location as sample 34-36 in flow. Background sensors: O2=2.25-2.30 for samples 38-40.	12 55.333	143 38.950	2928	268	2554
12-01	7:26	J797-HFS-39	J2_797BF22	Saipanda Horn	Filtered Bag 22. Start 07:24. Stop 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2557
12-01	7:35	J797-HFS-40	J2_797BF20	Saipanda Horn	Filtered bag 20. Start 07:33. Stop 07:35. Tmax=16.5; T2=7.4; Vol=495mL. top 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2568
12-01	7:45	J797-HFS-41	J2_797Ster9	Saipanda Horn	Sterivex Filter 9. Start 07:45. Stop=08:09. Tmax=25.9; Tavg=16.7; T2=7; Vol= 3186mL. top 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2586
12-01	8:11	J797-HFS-42	J2_797RNA13	Saipanda Horn	RNA Filter 13. Start=08:11. Stop=0:827. Tmax=23.4; Tavg=18.7; T2=7; Vol=3000mL. top 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2610
12-01	8:27	J797-HFS-43	J2_797RNA14	Saipanda Horn	RNA Filter 14. Start= 08:27. Stop=08:44. Tmax=22.5; Tavg=17.9; T2=6.5; Vol=3000mL. (same location)	12 55.333	143 38.950	2928	268	2630
12-04	9:12	J798-HFS-01	J2_798P1	Champagne Site (at Mkr144)	Unfiltered piston #1. Start. 09:12. Stop 09:15. Tmax=16.9 Tavg=14.3 vol=400mL T2=6. (At Mrk-144 Champagne area. Flow area to right of a rock.)	21 29.2442	144 2.4851	1608	56	4395

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
12-04	9:19	J798-HFS-02	J2_798Ster9	Champagne Site (at Mkr144)	Sterivex filter 9. Start 09:19. Stop 09:41. Tmax=26.5 Tavg-18.5 vol=3046mL T2=12.0. (same location)	21 29.2442	144 2.4851	1608	56	4406
12-04	9:42	J798-HFS-03	J2_798PF4	Champagne Site (at Mkr144)	Filtered piston #4 Start 09:42. Stop 09:47. Tmax=26.2. Tavg=25.2 Vol=450mL T2=12. (same location)	21 29.2442	144 2.4851	1608	56	4434
12-04	10:08	J798-HFS-05	J2_798PF2	Champagne Site (at Mkr144)	Filtered piston #2. Start 10:08. Stop 10:11. Tmax=70.9 Tavg=67. T2=25. Vol=451mL. (Champagne 6m NW of Mrk144. 70+C water from hole in sulfur and mat.)	21 29.2442	144 2.4851	1607	59	4475
12-04	10:12	J798-HFS-06	J2_798P3	Champagne Site (at Mkr144)	Unfiltered pison #3. Start 10:12. Stop 10:15.Tmax=63; Tavg=56; T2= 21; Vol=451mL. (same location)	21 29.2442	144 2.4851	1607	59	4483
12-04	10:18	J798-HFS-07	J2_798RNA14	Champagne Site (at Mkr144)	RNA filter 14. Start 10:18. Stop 10:35. Tmax=66.1; Tavg=65.1; T2=22.6; Vol=3001mL. (same location with a slight reposition of nozzle-little white chimlet next to nozzle)	21 29.2442	144 2.4851	1607	59	4491
12-04	11:35	J798-HFS-09	J2_798B17	Champagne Site (at Mkr144)	Unfiltered bag #17. Start 11:35. Stop 11:37. Tmax=17.6; Tavg=17.3; T2=18.5; Vol=303mL. (Moved back to base of Mkr-144 by slab of sulfur)	21 29.2442	144 2.4851	1606	65	4612
12-04	11:41	J798-HFS-10	J2_798RNA16	Champagne Site (at Mkr144)	RNA (later) filter #16. Start 11:41. Tmax=20.0; Tavg=18.90; T2=9; Vol=3007mL. (same location) Sensors: pH=4.7 O2=1.6 for samples 9 and 10.	21 29.2442	144 2.4851	1606	65	4626
12-04	15:46	J798-HFS-21	J2_798B23	Yellow Cone (at Mkr146)	Unfiltered Bag #1. Start 15:46. Stop 15:48. Tmax= 29.0C; Tavg= 27.3C; T2= 5C; Vol= 350mL.	21 29.2674	144 2.5194	1579	255	5072
12-04	15:49	J798-HFS-22	J2_798BF24	Yellow Cone (at Mkr146)	Filtered Bag #24 Start: 15:49. Stop: 15:51. Tmax= 30.5C; Tavg= 30.1C; T2= 7C; Vol= 353. Sensors: pH=5.42 O2=0.51ml/L.	21 29.2674	144 2.5194	1579	255	5078
12-04	15:58	J798-HFS-23	J2_798RNA15	Yellow Cone (at Mkr146)	RNA Later Filter #15 Start 15:58. Stop 16:21. Tmax= 34.0 C; Tavg= 33.6 C; T2= 3-4C; Vol=3000 mL.	21 29.2674	144 2.5194	1579	255	5090
12-04	18:06	J798-HFS-30	J2_798BF22	Yellow Cone (at Mkr124)	Filtered Bag 22 Start 18:06. Stop 18:09. Tmax=22.5; Tavg=21.9; T2=9; vol=450mL. Sensors: pH=5.36 O2=0.29mL/l (same location; tip in yellow mat)	21 29.2739	144 2.5189	1584	183	5295
12-04	18:10	J798-HFS-31	J2_798B21	Yellow Cone (at Mkr124)	Unfiltered bag 21. Start 18:10. Stop 18:13 Tmax=23.0 Tavg=22.7 T2=9 vol=475mL.	21 29.2739	144 2.5189	1584	183	5300

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
12-04	18:15	J798-HFS-32	J2_798Ster13	Yellow Cone (at Mkr124)	Sterivex filter 13. Start 18:15. Stop 18:32 Tmax=25.3 Tavg=24.0 T2=10 vol=3000mL.	21 29.2739	144 2.5189	1584	183	5307
12-04	20:03	J798-Major-33	J2_798MB	Yellow Cone (at Mkr124)	Black Major fired. (same orifice as samples 30-32)	21 29.2739	144 2.5189	1584	215	5474
12-04	20:31	J798-Major-35	J2_798MY	Yellow Cone (at Mkr124)	Yellow major. (same hole as samples 30-33)	21 29.2739	144 2.5189	1584	215	5520
12-05	7:16	J798-HFS-39	J2_798BF20	Mid-water	Filtered Bag 20. Background water samples after Reson survey.	21 29.4238	144 2.6141	1733	51	6459
12-05	7:20	J798-HFS-40	J2_798B19	Mid-water	Unfiltered Bag 19. Bacground water samples after Reson survey.	21 29.4238	144 2.6141	1725	190	6466
12-13	14:24	J799-HFS-03	J2_799B23	Lower Yellow Cone - Mkr124	Unfiltered Bag #23. Start Time: 14:24. Stop: 14:26. Tmax= 11.6C; Tavg= 11.0C; T2= 4.2C Vol= 400 mL. HFS Sensors: pH=5.24. O2=1.57ml/L. Same location sample #02 taken.	21 29.2746	144 2.5211	1583	170	11947
12-13	14:27	J799-HFS-04	J2_799BF24	Lower Yellow Cone - Mkr124	Filtered Bag #24. Start: 14:27. Stop Time: 14:29. Tmax= 12.3C; Tavg= 12.0C; T2= 4.2 C; Vol= 413mL. Same location as sample 2 & 3.	21 29.2746	144 2.5211	1583	170	11952
12-13	15:36	J799-HFS-13	J2_799P1	Upper Yellow Cone - Mkr146	Unfiltered Piston #1. Start 15:36. Stop 15:39. Tmax= 33.4C; Tavg= 33.2C; T2= 16.2C; Vol= 601mL. HFS sensors T=30C pH=5.21 O2=1.19. Same location as samples 10-12 but moved probe around to find highest flow and temperature.	21 29.2635	144 2.5244	1580	245	12087
12-13	18:38	J799-HFS-29	J2_799PF2	Razorback	Filtered Piston #29. Same location as samples 27-28 (placed on either side of the structure) in flow at top of fragile sulfide structure. HFS sensors: pH=4.45 O2=1.45.	21 29.2498	144 2.5074	1566	173	12411
12-13	18:42	J799-HFS-30	J2_799P3	Razorback	Unfiltered Piston #30. Same location and flow. Start 18:42. Stop 18:45. Tmax=20.6 Tavg=17.9 T2=7 vol=450 mL.	21 29.2498	144 2.5074	1566	173	12417
12-13	19:18	J799-HFS-33	J2_799Ster13	Champagne - Mkr144	Sterivex #13 taken with wand in holster. Start 19:18. Stop 19:30. Tmax=3.0 Tavg=2.7 vol=2196 mL. Sample collection in background while recovering instruments (samples 34-35). 7m to the west of Mkr144.	21 29.2434	144 2.4938	1608	93	12514

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
12-13	19:47	J799-HFS-37	J2_799B19	Champagne - GoldenLips	Unfiltered Bag #19. Start 19:47. Stop 19:50. Tmax=2.7 Tavg=2.7 vol=473 mL. In clump of mussels. Location is to NW of previous sample on small ridge with mussel density increasing as move west away from sulfides. HFS sensor: pH=5.78.	21 29.2567	144 2.4813	1606	74	12597
12-13	20:00	J799-HFS-39	J2_799BF20	Champagne - GoldenLips	Filtered Bag #20. Start 20:00. Stop 20:03. Tmax=2.8 Tavg=2.7 vol=550mL. Wand in holster while Jason securing basket before ascent. Same location as samples 37-38.	21 29.2567	144 2.4813	1606	74	12634
12-16	21:40	J800-HFS-01	J2_800B17	Phantom	Unfiltered Bag #17. Start 21:40. Stop 21:44. Tmax=9.9 Tavg=9.5 T2=7.8 vol=500mL. In shimmering water with filamentous microbial mats and biota.	14 36.052	144 46.514	555	55	12862
12-16	22:07	J800-HFS-03	J2_800BF18	Brimstone	Filtered bag #18. Start 22:07. Stop 22:11. Tmax=9.2 Tavg=8.9 T2=7.5 Vol=500ml. In crevice on the way to Sulfur Crust in area with high shrimp concentration and bits of sulfur. HFS sensor: pH=6.12.	14 36.0518	144 46.532	551	38	12925
12-16	22:19	J800-HFS-04	J2_800PF2	Arrowhead	Filtered piston #2. Start 22:20. Stop 22:22. Tmax=102.3 Tavg=102 T2=33 Vol=450mL. Intense swarm of shrimp.	14 36.058	144 46.535	544	47	12953
12-16	22:25	J800-HFS-05	J2_800P3	Arrowhead	Piston #3. Start 22:23. Stop 22:26. Tmax=101.6 Tavg=100.6 T2=34. Vol=450mL	14 36.058	144 46.535	544	47	12962
12-16	22:29	J800-HFS-07	J2_800BF24	Arrowhead	Unfiltered Bag #24. Start 22:30 Stop 22:31. Tmax=101.8 Tavg=101.6 T2=33 Vol=450mL.	14 36.058	144 46.535	544	47	12973
12-16	22:38	J800-major-09	J2_800MR	Arrowhead	Red major taken at same location as all other Arrowhead samples with Tmax=102C. Major was re-triggered as taking too long to fill. Sample looked good.	14 36.058	144 46.535	544	47	12989
12-16	23:06	J800-HFS-10	J2_800Ster13	near Charon to TipIce	Sterivex #13. Background sample for Sheryl. HFS wand in holster as we transit. Stervex paused at 1500ml and 23:13. Stop 01:38 near at TipIce. Tavg=6.9 Vol=4516mL. Sterivex #13. This sample was stopped mid-sample then re-started after many other sample	14 36.0287	144 46.5636	584	61	13042

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
12-16	23:26	J800-HFS-11	J2_800B19	SmokingStones	Unfiltered bag #19. Start 23:26. Stop 23:29. Tmax=10.4 Tavg=10.2 T2=8. Vol=475mL. HFS sensor: pH=5.8 O2=1.0. Area of a lot of smoke around rocks but not very hot temperatures.	14 36.0330	144 46.5698	590	318	13083
12-16	23:29	J800-HFS-12	J2_800BF20	SmokingStones	Filtered bag #20. Start 23:30. Stop 23:32. Tmax=10.7 Tavg=10.4 T2=8.2 Vol=475mL.	14 36.0330	144 46.5698	590	318	13092
12-16	23:34	J800-HFS-13	J2_800Ster14	SmokingStones	Sterivex #14. Start 23:34. Stop 23:46. Tmax=10.7 Tavg=10.0 T2=7.5 Vol=3000mL.	14 36.0330	144 46.5698	590	318	13099
12-17	0:45	J800-HFS-16	J2_800B23	Menagerie	Unfiltered bag #23. Start 00:45. Stop 00:48. Tmax=18.8 Tavg=18.7 T2=11 Vol=476mL. HFS sensor: pH 5.59. O2=0.44. Area of diffuse flow coming through the rocks with filamentous bacteria mat and diverse biology.	14 36.0547	144 46.574	534	70	13262
12-17	0:49	J800-HFS-17	J2_800BF22	Menagerie	Filtered Bag #22. Start 00:49. Stop 00:52. Tmax=19.1 Tavg=18.6 T2=11 Vol=476.	14 36.0547	144 46.574	534	70	13271
12-17	0:53	J800-HFS-18	J2_800Ster15	Menagerie	Sterivix #15. Start 00:53. Stop 01:06. Tmax=19.6 Tavg=19.4 T2=11. Vol=3000mL. Same position as previous HFS samples at Menagerie. HFS sensors: pH=5.67. O2=0.20 for last 3 samples.	14 36.0547	144 46.574	534	70	13279
12-17	3:27	J800-HFS-28	J2_800P1	Crab Cavern@FaultShrimp	Unfiltered Piston #1. Start 03:27. Stop. 03:30. Tmax=10.7 Tavg=10.6 T2=7.9 vol=550mL. HFS sensor: pH=6.0.	14 36.056	144 46.6495	565	52	13549
12-17	3:31	J800-HFS-29	J2_800PF4	Crab Cavern@FaultShrimp	Filtered Piston #4. Start 03:31. Stop 03:34. Tmax=10.5 Tavg=10.4 T2=7.8 vol=550 mL. Same location.	14 36.056	144 46.6495	565	52	13561
12-17	3:36	J800-HFS-30	J2_800B21	Crab Cavern@FaultShrimp	Unfiltered Bag #21. Start 03:36. Stop 03:39. Tmax=10.4 Tavg=10.3 T2=7.7 vol=500mL.	14 36.056	144 46.6495	565	52	13571
12-17	3:43	J800-major-31	J2_800MW	Crab Cavern@FaultShrimp	White major at Crab Cavern. Tmax was 10.4 in this site. Same location.	14 36.056	144 46.6495	565	51	13582
12-17	19:00	J801-HFS-06	J2_801B17	GoldenHorn base	Unfiltered Bag #17. Start 19:00. Stop 19:04. Tmax=14.5 Tavg=13.1 T2=5.1 vol=575mL. Taken at same location as samples 1-5. In the upper part of the fluffy mat. HFS Sensors: O2=108uM pH=5.68 at T=11.8C. Jason O2 in holster=132.5uM.	12 55.3426	143 38.9555	2930	153	13961

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
12-17	19:05	J801-HFS-07	J2_801BF18	GoldenHorn base	Filtered Bag #18. Start 19:05. Stop 19:08 Tmax=10.0 Tavg=8.2 T2=4.0 vol=575mL. Same location.	12 55.3426	143 38.9555	2930	153	13967
12-17	19:17	J801-HFS-08	J2_801Ster13	GoldenHorn base	Sterivex #13. Start 19:17. Stop. 19:31 Tmax=30.2 Tavg=25.0 T2=9.4 vol=3000mL. Repositioned to upper portion of fluffy mat. HFS sensor: O2=75uM at 38decC (O2=1.69xx).	12 55.3426	143 38.9555	2930	154	13988
12-17	20:30	J801-HFS-12	J2_801B19	GoldenHorn middle	Unfiltered Bag #19. Start 20:30. Stop 20:33. Tmax=10.3 Tavg=8.5 T2=5 vol=575mL. HFS sensor: O2=114uM pH=5.95 (check) at T=7-8degC. Same location.	12 55.3426	143 38.9555	2928	132	14129
12-17	20:40	J801-HFS-13	J2_801BF20	GoldenHorn middle	Filtered Bag #20. Start 20:40. Stop 20:44. Tmax=10.4 Tavg=10.1 T2=4.5 vol=575mL. Wand tip moved slightly to get temperature rise. HFS sensor: O2=108uM. pH=5.9 (check).	12 55.3426	143 38.9555	2928	132	14146
12-17	21:33	J801-HFS-16	J2_801PF8	GoldenHorn top	Filtered Piston #8. Start 21:33. Stop 21:37. Tmax=15.9 Tavg=11.6 T2=5 vol=700mL. In flow near top of chimney. HFS sensor: O2=89uM at T=19C.	12 55.3426	143 38.9555	2922	167	14248
12-17	21:38	J801-HFS-17	J2_801P7	GoldenHorn top	Unfiltered Piston #7 Start 21:38. Stop 21:42. Tmax=12.8 Tavg=12.6 T2=5.2 vol=640mL.	12 55.3426	143 38.9555	2922	167	14258
12-17	21:43	J801-HFS-18	n/a	GoldenHorn top	Sterivex #14. Start 21:43. Stop 21:59. Tmax=14.1 Tavg=12.1 T2=5.3 Vol=3000mL. Same location near top of GoldenHorn. No sample.	12 55.3426	143 38.9555	2922	167	14265
12-18	4:43	J801-major-33	J2_801MB	GoldenHorn base	Black Major. Same location as T=74C measured before sample taken.	12 55.3431	143 38.9534	2930	135	14893
12-18	5:07	J801-HFS-37	J2_801Ster10	GoldenHorn top	Sterivex Filter #10. Start 05:07. Stop 05:23. Tmax=11.8 C; Tavg= 9.6C; T2=4.0C; Vol= 3004mL. HFS sensor: pH=5.68. O2=2.43mL/l.	12 55.3431	143 38.9534	2922	185	14948
12-18	5:34	J801-HFS-38	J2_801PF2	Ultra-no-chichi	Filtered Piston #2. Start 05:35. Stop 05:37. Tmax= 184.2C; Tavg= 179.3C; T2=58.9C; Vol= 554mL.	12 55.3378	143 38.9521	2929	132	14993
12-18	5:38	J801-HFS-39	J2_801P3	Ultra-no-chichi	Unfiltered Piston #3. Start 05:38. Stop 05:41. Tmax= 178.7C; Tavg= 173.3C; T2= 57.3C; Vol= 554ml.	12 55.3378	143 38.9521	2929	132	15000

Date UTC	Time UTC	Jason sample ID	Lab sample ID	Site	comments	Latitude (N)	Longitude (E)	Depth	Heading	Virtual Van #
12-18	5:53	J801-major-42	J2_801MR	Ultra-no-chichi	Red Major. Same location as GTHFS samples 41 and 42. Exhaust verified. Temperature 178-184degC. HFS sensors: O2=2.1mL/l (=94uM) where sampled for samples 40-42.	12 55.3378	143 38.9521	2929	132	15020
12-18	6:08	J801-HFS-43	J2_801P5	Ultra-no-chichi	Unfiltered Piston #5. Start 06:08. Stop 06:11 Tmax=17.3 Tavg=16.3 T2=8 vol=600mL. Location is the shrimp habitat in the flow.	12 55.3378	143 38.9521	2929	123	15049
12-18	6:57	J801-HFS-47	J2_801B23	ascent	Unfiltered Bag #23. Background water sample. Start 06:47. Stop 07:02. Depths 2525-2388.	12 55.314	143 38.91	0	0	15132
12-18	7:01	J801-HFS-48	J2_801BF24	ascent	Filtered Bag #24. Start 07:02. Stop 07:05 Depths 2376-2262.	12 55.315	143 55.315	0	0	15138

HFS sample at NW Eifuku (J799-HFS-37).

Table 4.2.1-2. Hydrothermal Fluid Sampler Configuration

HFS valve position	Type (sampler and filt holder material)	Filtered?	Front Pressure Relief Valve	Back Pressure Relief Valve
1	Piston, PVC, PP	No	20	5
2	Piston, Ti, Teflon	Yes	100	40
3	Piston, Ti, Teflon	No	75	40
4	Piston, Ti, Teflon	Yes	75	40
5	Piston, Ti, Teflon	No	75	40
6	Piston, PVC, Teflon	Yes	20	5
7	Piston, PVC, Teflon	No	20	5
8	Piston, PVC, PP	Yes	20	5
9*	Piston, Ti, Tef	No	75	none
10	Sterivex filter			
11	Sterivex filter			
12	pH and O2 sensors			
13	Sterivex filter			
14†	RNA-Later filter			
15†	RNA-Later filter			
16†	RNA-Later filter			
17	Bag, Tedlar, PVC-PP	No		5
18	Bag, Tedlar, PVC-PP	Yes		20
19	Bag, Tedlar, PVC-Teflon	No		5
20	Bag, Tedlar, PVC-PP	Yes		5
21	Bag, Tedlar, PVC-Teflon	No		20
22	Bag, Tedlar, PVC-Teflon	Yes		5
23	Bag, Tedlar, PVC-PP	No		5
24	Bag, Tedlar, PVC-Teflon	Yes		20

*Position 9 had a Sterivex filter on dives 797 and 798. †RNA-Later filter holders were removed after the first two dives and replaced with Sterivex filters. Positions 11 and 16 were vacant on dive 799.

The filter holder inlet end caps for pistons and bags, as well as the pistons themselves, were cleaned between sampling by flushing with hot water, wiping with Kim-wipes (with ethanol added to the Kim-Wipes to remove any excess Fluorolube or particles), rinsed again with hot water, rinsed with de-ionized water, and then rinsed with filtered deep seawater. The HFPS intake line and manifold were thoroughly rinsed with fresh water between dives and the manifold was flushed with seawater during the descent.

Sample Processing

HFS sample trays were stored in the cold room and samples were processed one at a time.

1. If a gas headspace was present, the entire headspace volume was removed into one gas-tight syringe and the total gas volume measured. Gas was analyzed by GC for hydrogen and methane.
2. An aliquot (10-20 ml) of liquid was removed into a syringe (syringe rinse discarded) and analyzed by GC for hydrogen and methane.
3. An aliquot (20-35ml) was removed into a syringe for hydrogen sulfide analysis by methylene blue spectrophotometry. The same aliquot was used for making a dilution for silica analysis by molybdate spectrophotometry, and for ammonia analysis by indophenol spectrophotometry after acidification and purging with nitrogen gas. We used an alternative phenol-containing reagent for ammonia.
4. An aliquot (35ml) was transferred by syringe to a 30ml bottle, filled to the top from the bottom slowly using a filling tube. pH was measured using the Brinkmann pH electrode at room temperature (21-26°C, recorded manually). Alkalinity titrations done on this aliquot after pH measurement.

5. An aliquot was syringe-filtered (sterile, SFCA, 0.2 micron, lot#17597) into a 30ml hdpe bottle, full, no head space, for major elements. Syringes were acid cleaned.
6. 45-50ml was transferred by syringe into pre-labeled hdpe bottles and frozen for nutrient and N/O isotopic analysis of nitrate to be sent to Annie Bourbonnais. Bottle numbers ("DIN") recorded. Samples were syringe filtered through 0.2micron SFCA unless otherwise noted. The samples were not purged.
7. 45ml was transferred by syringe into pre-labeled hdpe bottles with NaOH solution for N/O isotopic analysis of nitrite by Annie Bourbonnais. Bottle numbers ("BNO2") recorded.
8. 45ml transferred by syringe into a glass bottle with Teflon-lined top (cleaned by rinsing with DIW and baking at 550C for 8 hours, wrapped in aluminum foil) for dissolved organic carbon analysis at UW. Samples that were not in-situ filtered were filtered through 0.2 micron syringe filters unless noted as not filtered (n.f.).
9. Available remaining volume expressed directly from bag or piston or major sampler into I-Chem hdpe bottle for trace metal analysis. Acidified with ultra-pure, sub-boiling distilled HCl (2µl/ml). For some samples, 3ml was transferred to a small tube for on-board iron analysis by ferrozine method (Sean McAllister).
10. For selected samples, variable volumes were given to: a) Sheryl Murdock for cell counts and microbial/protist incubations and analysis; b) Jason Sylvan for Organic Nitrogen analysis.
11. For selected high-temperature samples, aliquots were saved for sulfur isotope analysis (45ml in glass vial, filled from bottom, plus 0.5ml 10wt% Cd acetate solution, capped, no headspace).
12. For selected samples from NW Rota, 20ml glass vial filled slowly from bottom, preserved with 50µL 37% formaldehyde for sulfur dioxide analysis.
13. For selected samples, 10ml of sample was injected through a rubber septum into an evacuated glass vial, to be analyzed total dissolved inorganic carbon by Giora Proskurowski at University of Washington.
14. Filters (when present) were rinsed with a few mL of DIW in the HFS filter holders, excess water was suctioned off, and the filter placed in a clean, covered slide labeled with filter number and sample number. Filters were air-dried in a laminar flow hood and then placed in a dessicator box.

Frozen samples were shipped to Seattle by Fed Ex immediately after the cruise and arrived in Seattle still frozen. Unfrozen samples were sent in the container shipment.

For geochemistry samples collected with the Bio-Mat Sampler syringes, we sub-sampled for gases (~10ml), H2S and Si (~10ml), trace metals and cations (~17ml), anions (2ml), DIC (10ml), nutrients/N isotopes (40ml), and pH/alkalinity (18ml).

Note that Dive J2-798 did not have a normal recovery, and this affected sample quality for that dive, particularly for samples with very high gas content. When the sampler decompresses, piston samplers can first expand to their full volume by pushing water out the back side of the piston through a pressure relief valve. If excess gas pressure is high enough to overcome the higher pressure relief valve on the sample, then gas will vent out the top of the piston. Because the ROV returned to a depth of 800 meters after being at the surface, samples that expanded when decompressed would contract again when recompressed, resulting in seawater being pushed into the sample container until pressure equalized. The check valve only prevents sample escaping, not entering the sampler. So, samples that had enough gas pressure to force the piston to expand have been diluted with seawater, up to a maximum of approximately 1:1 in the extreme.

Oxygen and pH sensors

A Seabird SBE63 oxygen optode (serial number 00442) and a deep-sea pH sensor from AMT (serial number 28 used on dives 797-799, refurbished in June 2013, previously deployed with HFS in 2013 and 2014 cruises and calibrated before and during the cruise; serial number 31 used on dives 800-801), were both plumbed in line on valve position 12. Fluid is pumped through the sensors to take a measurement and the data are recorded in the HFS log file. We used both sensors during descent/ascent through the water column and for spot measurements in low-temperature vents and in near-bottom waters near vent sites. The oxygen sensor perfomed reliably throughout the cruise. The pH sensor was stable and gave appropriate values for background pH. We replaced the pH sensor with a newly refurbished and calibrated sensor prior to the start of dive 800 at NW Rota. The new sensor (s/n 31) was noisy and did not give reasonable results at depth. We will examine the data and the sensor more closely post-cruise.

Table 4.2.1-3. Vent Fluid Sample Splitting

		Sample Splitting Information, Dive 797 at Snail/Urashima																		
Jason sample#	lab sample#	HFS filter ID	Sample volume mL	gas head mL	gas-H2O mL	pH/Alk mL	H2S/Si mL	Majors mL	DIN mL	DIN #	BNO2 mL	BNO2 #	DOC mL	TM mL	Fe-ship	DIC Giora	Microbio	DON Jason S.	Nuts UW	S isotope
J797-HFS-02	J2_797BF24	G13-104	553		35	35	25	35	60	501	60	612	80	220						3
J797-HFS-03	J2_797B23		45			10		35												
J797-HFS-19	J2_797B17		593		45	35	38	35	55	504	55	606	80	250						
J797-HFS-20	J2_797P1		480		20	37	40	35	50	509 n.f.	50	610	45	200	3					
J797-HFS-21	J2_797P3		118		15	35	18	35						15						
J797-HFS-22	J2_797PF2	G13-105	35					35												
J797-HFS-23	J2_797P5		370		20	35	30	35						250						
J797-Major-25	J2_797MW		610		15	35	25	35	60	539, n.f.	60	611, n.f.	80	250					50	
J797-Major-26	J2_797MR		660		20	35	25	35	100	502, 511	100	0 not filt'd, 6	40	250						45
J797-HFS-29	J2_797PF4	G13-106	698		30	35	30	35	50	507	45	601	90	200	3					
J797-HFS-30	J2_797P7		538		20	35	25	35	50	518	50	603	90	230	3					
J797-HFS-32	J2_797PF6	G13-107	475		30	35	25	35	50	505	50	602	95	110						45
J797-HFS-38	J2_797B21		573		45	35	25	35	60	527	60	604	80	110	3		120			
J797-HFS-39	J2_797BF22	G13-103	515		35	35	30	35	60	532	60	615	80	180						
J797-HFS-40	J2_797BF20	G13-102	433		40	40	25	35	50	503	50	616	80	110	3					

		Sample Splitting Information, Dive 798 and 799 at NW Eifuku																	
Jason sample#	lab sample#	HFS filter ID	Sample volume mL	gas head mL	gas-H2O mL	pH/Alk mL	H2S/Si mL	Majors mL	DIN mL	DIN #	BNO2 mL	BNO2 #	DOC mL	TM mL	Fe-ship	DIC Giora	Microbio	DON Jason S.	Nuts UW
J798-HFS-39	J2_798BF20	G13-113	305		30	35	30	35	50	593				125					
J798-HFS-40	J2_798B19		425		40	70	30	35						250					
J798-HFS-01	J2_798P1		469	340	12	40	45	35	50	516	50	619	42	145			50		
J798-HFS-03	J2_798PF4	G13-118	462	570	10	35	37	40	45	598	45	643	50	200					
J798-HFS-05	J2_798PF2	G13-117	727	800	10	35	32	35	45	506	40	622	90	425		15			
J798-HFS-06	J2_798P3		787		7	35	37	70	45	537	45	626	90	450	8				
J798-HFS-21	J2_798B23		330		25	35	35	35	50	525	45	697	40	50					15
J798-HFS-22	J2_798BF24	G13-116	275		22	35	35	35	45	581	40	683		60	3				
J798-HFS-30	J2_798BF22	G13-115	335		20	35	35	35	45	519	45	634		120					
J798-HFS-31	J2_798B21		332	4	25	35	30	35	45	587 n.f.	32	617 n.f.		125	5				
J798-Major-35	J2_798MY		626		10	35	40	35	50	513	50	621	90	300	6	10			
J799-HFS-03	J2_799B23		Empty																
J799-HFS-04	J2_799BF24	G13-122	134		10	35	10	15						32	3	13			
J799-HFS-13	J2_799P1		266		10	35	30	35						70	6	20		60	
J799-HFS-29	J2_799PF2	G13-120	250											250					
J799-HFS-30	J2_799P3		363	670	10	35	20	35	50	550	50	699	40	120	3				
J799-HFS-37	J2_799B19		343		12	35	20	35	50	551	40	693		75	6	10	60		
J799-HFS-39	J2_799BF20	G13-119	225		12	35	40	35	60	552				30	3	10			

		Sample Splitting Information, Dive 800 at NW Rota																		
Jason sample#	lab sample#	HFS filter ID	Sample volume mL	gas head mL	gas-H2O mL	pH/Alk mL	H2S/Si mL	Majors mL	DIN mL	DIN #	BNO2 mL	BNO2 #	DOC mL	TM mL	Fe-ship	DIC Giora	Microbio	DON Jason	SO2	S iso
J800-HFS-16	J2_800B23		98		10	18	20	18						17			15			
J800-HFS-17	J2_800BF22	G13-125	196		10	35	20	18	55	568				55	3					
J800-HFS-28	J2_800P1		339		12	35	35	35	50	569	35	138	35	86			16			
J800-HFS-29	J2_800PF4	G13-121	225		13	35	39	18					30	90						
J800-HFS-30	J2_800B21		284		10	35	20	36	45	586			35	100	3					
J800-major-31	J2_800MW								40	556	40	189	80							
J800-HFS-01	J2_800B17		269		10	35	35	35	45	563			35	54			20			
J800-HFS-03	J2_800BF18	G13-112	156		10	18	20	18					35	55						
J800-HFS-04	J2_800PF2	G13-123	238	110	12	35	16	35					36	65	3				36	
J800-HFS-05	J2_800P3		71		7	18	10	18											18	
J800-HFS-07	J2_800BF24	G13-126	202		10	18	20	30	48	574			35	18	3				20	
J800-major-09	J2_800MR		539	100		35	30	35	55	557	45	160	73	50	3			150	18	45
J800-HFS-11	J2_800B19		293		10	35	20	18	45	592			35	30			100			
J800-HFS-12	J2_800BF20	G13-124	141		10	35	20	18						55	3					

		Sample Splitting Information, Dive 801 at Urashima																
Jason sample#	lab sample#	HFS filter ID	Sample volume mL	gas head mL	gas-H2O mL	pH/Alk mL	H2S/Si mL	Majors mL	DIN mL	DIN #	BNO2 mL	BNO2 #	DOC mL	TM mL	Fe-ship	DIC Giora	Microbio	DON Jason
J801-major-3	J2_801MB		713		0	35	30	35					50	60	3			500
J801-HFS-38	J2_801PF2	G13-131	313		25	35	30	35	60	561				125	3			
J801-HFS-39	J2_801P3		386		22	35	50	35	45	573	35	144	35	115	3	11		
J801-major-42	J2_801MR		728		20	35	30	35	50	567	50	687	80	245	3			180
J801-HFS-43	J2_801P5		494		22	35	30	35	45	579	35	184	37	125		10	120	
J801-HFS-47	J2_801B23		377		22	35	30	35	45	585	60	700	40	110				
J801-HFS-48	J2_801BF24	G13-129	212		22	35	30											125
J801-HFS-06	J2_801B17		10	failed sample										10				
J801-HFS-07	J2_801BF18	G13-101	233		12	35	35	35	40	571	30	104		43	3			
J801-HFS-12	J2_801B19		348		22	35	35	18	45	572				80	3		110	
J801-HFS-13	J2_801BF20	G13-122	227		24	35	30	35	45	584	40	170		18				
J801-HFS-16	J2_801PF8	G13-111	253		22	35	33	35						125	3			
J801-HFS-17	J2_801P7		392		22	35	30	35	40	580	37	163	40	125	3	10	15	

4.2.2 Gas Sampling

Leigh Evans (NOAA/PMEL/EOI – OSU)

A total of 13 gas-tight samples were collected during the cruise. 10 of them were connected to the manifold of HFS and 3 were taken as discrete hand-held samples. The sample information is shown in the table below and includes the gas-tight bottle number stamped on the titanium sampler, the color or HFS position, the vent site and the measured temperature and total gas content. We did not attempt to sample the pure liquid CO2 at NW Eifuku, but sampled warm fluids in the Champagne area with liquid droplets venting nearby.

For now only total gas concentration is known. For each sample several portions of each gas were sealed in glass ampules. The main analyses will be helium isotopes, carbon dioxide, sulfur gases, methane and hydrogen.

The samples at Active, Snail and Urashima are new to the collection of the Helium Isotope Lab at PMEL.

Dive	GTB	sampler	Vent	Vent (degC) Temperature	[gas] m-mole/kg
J2-797	9	red	Snail mkr24 HFS27	190 max	3.54
J2-797	7	stbd HFS	Urashima HFS31	161	19.19
J2-797	5	port HFS	Snail mkr24 HFS24	174	4.85
J2-798	5	port HFS	Eifuku Champagne mkr 144 HFS04	26.2	186.14
J2-798	7	stbd HFS	Eifuku Champagne mkr 144 HFS08	66.1	358.14
J2-799	5	port HFS	Eifuku Champagne Golden Lip HFS40	2.8	3.77
J2-799	7	stbd HFS	Eifuku Upper Yellow Cone mkr146 HFS14	33.4	46.84
J2-800	5	port HFS	Eifuku Arrowhead HFS06	101.6	90.37
J2-800	7	stbd HFS	Eifuku Smoking Stones HFS14	10.5	6.55
J2-800	9	red	Eifuku Crab Cavern@Fault Shrimp HFS32	10	3.50
J2-800	2	green	Eifuku Menagerie HFS19	19.6	6.87
J2-801	5	port HFS	Active HFS40	178 - 184	23.93
J2-801	7	stbd HFS	Active HFS41	178 - 184	23.17

4.3 Water Column Operations

4.3.1 CTD

Sharon Walker (NOAA/PMEL/EOI)
Joe Resing (NOAA/PMEL/EOI – UW)
Nathan Buck (NOAA/PMEL/EOI – UW)

The goals of water column CTD operations during this cruise were to: (1) assess the current level of eruptive/hydrothermal activity at sites of known volcanic eruptions, primarily NW Rota-1, which had been erupting near-continuously between 2004 and 2010 when we last sampled there, and Ahyi volcano, which was recently erupting in April/May 2014; (2) to estimate the flux of hydrothermal components and CO_2 from an erupting volcano by conducting CTD tows downstream and perpendicular to the plume originating from the eruptive vent; and (3) to re-visit other sites in the area, if time allowed, to assess how these systems may have changed over time.

A total of 18 CTD casts were completed during this cruise (13 vertical casts and 5 tows, summarized in Table 4.3-1 using PMEL's CTD system: a Seabird 9*plus* CTD, with auxiliary sensors for optical backscatter, oxidation-reduction potential (ORP), pH, oxygen, and altitude above the seafloor. Water samples were taken at select times and depths and subsampled for: helium, hydrogen, methane, hydrogen sulfide, Total CO_2, nutrients, pH, scanning electron microscopy, particulate matter chemistry, iron (II), and dissolved and Total dissolvable trace metals. Table 4.3-2 shows a summary of the number of samples of each type that were collected from each CTD cast. The pH anomalies described below are in-situ values from the CTD-mounted pH sensor. Discreet water samples analyzed for pH in the lab provide more accurate, well calibrated pH values and are also noted.

CTD instrument deployed from R/V Revelle.

Table 4.3.1-1 CTD deployments (white: CTD Casts; green: CTD Tow-yos; yellow: Double CTD cast)

Cast	Station Name	Lat (deg) S	Lat (min) S	Long (deg) W	Long (min) W	Start time	End time	bottom depth	Comments
0	V14B-test	12	57.1120	143	37.0830	29-Nov-2014 13:39	29-Nov-2014 14:11	2854	test cast at "Snail" site (backarc) CTD to >600 m only (bottom depth 2854 m)
1	V14B-01	14	36.0440	144	46.4830	02-Dec-2014 05:34	02-Dec-2014 06:27	567	NW Rota - 50m south of Brimstone (altimeter not charged, bottom depth 590-600 m)
2	V14B-02	14	35.8280	144	45.3990	02-Dec-2014 10:29	02-Dec-2014 11:41	1420	1-2 km west of NW Rota summit - CTD to 1205 m (bottom depth = 1420 m)
3	V14B-03	20	26.7400	145	1.7790	03-Dec-2014 20:36	03-Dec-2014 02:33	524	Ahyi volcano - ~1 km N of summit
4	V14B-04	20	26.1620	145	1.8580	04-Dec-2014 01:11	04-Dec-2014 01:35	267	Ahyi summit - over crater S of summit ridge
5	V14B-05	20	26.3790	145	1.1730	04-Dec-2014 02:32	04-Dec-2014 03:07	217	Ahyi summit - over crater N of summit ridge
6	T14B-01(start)	20	27.0060	145	0.9550	04-Dec-2014 05:27			
	T14B-01(end)	20	27.0050	145	3.2270		04-Dec-2014 08:22		Ahyi - Flux experiment tow - across current ~ 1 km N of summit
7	V14B-06	21	49.0090	144	29.9950	09-Dec-2014 06:55	09-Dec-2014 09:32	3083	background cast (NE of Eifuku)
8	T14B-02(start)	21	24.0830	144	9.0960	09-Dec-2014 13:33			
	T14B-02(end)	21	25.4200	144	8.4250		09-Dec-2014 15:34		Eifuku - tow across summit (SE->NW)
9	V14B-07	20	22.6470	145	1.6680	10-Dec-2014 05:26	10-Dec-2014 06:20	2009	background near Ahyi - CTD to 505 m (bottom depth = 2009 m)
10	V14B-08	20	26.2260	145	1.7840	10-Dec-2014 07:30	10-Dec-2014 07:44	110	Ahyi summit - bottom depth too shallow to get to plume - NO BOTTLES TRIPPED
11	V14B-09	20	26.1470	145	1.7330	10-Dec-2014 08:30	10-Dec-2014 09:07	190	Ahyi summit
12	T14B-03(start)	21	19.5980	144	10.7600	11-Dec-2014 14:30			
	T14B-03(end)	21	20.0380	144	12.6250		11-Dec-2014 17:46		Daikoku - Flux experiment tow ~750 m downstream (North) of summit
13	T14B-04(start)	21	19.6560	144	11.3770	13-Dec-2014 04:01			
	T14B-04(end)	21	18.9290	144	11.4590		13-Dec-2014 05:40		Daikoku - Flux experiment tow ~300 m downstream (West) of summit

Cast	Station Name	Lat (deg) S	Lat (min) S	Long (deg) W	Long (min) W	Start time	End time	bottom depth	Comments
14	V14B-10	21	29.2410	144	2.4860	13-Dec-2014 22:34		1622	NW Eifuku "double profile" - first part over Champagne vent
		21	29.2680	144	2.5140		14-Dec-2014 00:38	1585	then moved ship slightly to be over "Yellow Cone" site
15	V14B-11	21	24.7470	144	8.7620	14-Dec-2014 04:30	14-Dec-2014 05:09	457	Eifuku - summit crater
16	V14B-12	18	45.1470	144	38.1540	15-Dec-2014 04:09	15-Dec-2014 04:45	4600	"clean bottle" test - CTD to 750 m (bottom depth ~4600 m)
17	V14B-13	14	36.0720	144	48.6060	16-Dec-2014 08:47	16-Dec-2014 09:38	2000	"clean bottle" test #2 - CTD to 1000 m (bottom depth ~2000 m)
18	T14B-05(start)	13	14.6960	144	0.5370	18-Dec-2014 12:57			
	T14B-05(end)	13	15.2340	144	1.9070		18-Dec-2014 15:37		Seamount X

Table 4.3.1-2 CTD bottle samples.

Cast	Cast #	Type	Station Name	Helium	H_2 and CH_4	pH	Nutrients	Total CO_2	Total Metals	Dissolved Metals	SEM	XRF	Fe(II)	H_2S
V14B-01	1	Vertical	NW Rota	5	5	28			11	2	1	2		
V14B-02	2	Vertical	NW Rota	6					6					
V14B-03	3	Vertical	Ahyi	9	12	28	8	8	16	9	4	8		
V14B-04	4	Vertical	Ahyi	2	2	6			2					
V14B-05	5	Vertical	Ahyi	5	6	21	8	4	8	4	1	3		
T14B-01	6	Tow	Ahyi	16	15	27		12	20	9		8		
V14B-06	7	Vertical	BKGRND	21	6	28	21	16	21	31		10		
T14B-02	8	Tow	Eifuku	8	10	22	8	9	10	4	1	4		
V14B-07	9	Tow	Ahyi BKG	6	5	19	7	6	10					
V14B-09	10	Vertical		7	7	23	10	5	10	6	2	6		
T14B-03	12	Tow	Daikoku	13	11	27	11	11	19	7	2	7		
T14B-04	13	Tow	Daikoku	12	11	28	4	4	17	8	2	8	4	9
V14B-10	14	Vertical	dbl vertical	9	9	28		9	10	5		6		
V14B-11	15	Vertical	Eifuku	7	4	17			7	3		3		
V14B-12	16	Vertical	Soak Cast						21					
V14B-13	17	Vertical	Bottle Test						21	27		6		
T14B-05	18	Tow	SMT X	9	9	18			13	6		4		
Totals				**135**	**112**	**320**	**77**	**84**	**222**	**121**	**13**	**75**		**9**

XRF are samples collected on 0.4 uM polycarbonate filters for chemical analysis by X-Ray Fluoresence Spectroscopy; SEM are samples collected on 0.4uM filters for Scanning Electron Microscopy;

NW Rota-1: Two CTD casts, one near the summit [V14B-01] and one west of the summit [V14B-02], detected no hydrothermal or eruptive plumes. This was consistent with the multibeam mid-water data that did not image bubble plumes coming from the summit (see EM122 mid-water data section). However, ORP anomalies in data from MAPRs deployed on the hydrophone/ADCP/MAPR mooring at the summit for the duration of this cruise showed hydrothermal activity is still present. Jason dive J800 confirmed the absence of eruptive activity and found that diffuse hydrothermal venting was supporting thriving biological communities.

Ahyi: Plumes with significant particle ($dNTU_{max}$= 1.5), ORP (ΔE= -80 mv) and pH (-0.6) anomalies were seen at 130-150 m water depth over the summit of Ahyi volcano, and deep particle layers (>400 m water depth) were seen downslope at two casts about 1 km north of the summit [V14B-03 and T14B-01(downcast)]. Discreet water sample pH measurements revealed pH anomalies to be no more than -0.1 pH unit and resolving discrepancies between the pH sensor and discreet measurements will be addressed. While we could not definitively confirm if eruptive activity was continuing at Ahyi, it is possible there was still a lower (not detected by seismic stations) level of activity ongoing, there was certainly a vigorous hydrothermal system seven months after the April/May 2014 event. Currents (see ADCP current monitoring section) were steady enough to direct the plume towards the north which allowed us to conduct one Flux Experiment tow approximately 1 km north of the summit [T14B-01]. Figure 4.3.1-1 shows the particle plume (dNTU), potential density contours, CTD tow trackline, bottle sample positions (□) and ORP anomalies during tow T14B-01 at Ahyi.

NW Eifuku: One vertical cast [V14B-10] was completed at NW Eifuku to collect plume samples in the water column above the two sites that were the focus of the ROV dives – "Champagne" and "Yellow Cone". These sites are located about 70 m apart on the seafloor. The ship was moved from one position to the other during the cast so that samples could be obtained from directly over each site. Similar to previous years, particles were nearly absent ($dNTU_{max}$= 0.005) in the plumes at NW Eifuku, but both ORP and pH sensors registered significant anomalies (ΔE= -80 mv; ΔpH= -0.15) within 50 m of the seafloor. Discreet pH measurements revealed pH anomalies to be ≈ -0.1 pH unit, consistent with the pH sensor data.

Eifuku: Eifuku volcano was one of the sites that did not have signs of hydrothermal activity during our initial survey of the Mariana arc volcanoes in 2003. Given the dynamic nature of the volcanoes in this region, and its nearby location, we completed one tow and one vertical cast at Eifuku [T14B-02 and V14B-11] to see if anything had changed. A layer of increased particle concentration ($dNTU_{max}$= 0.1; centered ~370 m), accompanied by generally decreasing ORP directly over the summit suggested that there was an active hydrothermal system at Eifuku. However, Daikoku volcano, ~11 km to the southeast of Eifuku, has been a site with intense hydrothermal plumes within the same depth range (350 – 400 m) and where pools of liquid sulfur were observed and sampled on the seafloor during previous cruises. A more significant ORP anomaly (ΔE= -8 mv) during vertical cast V14B-11 at the summit of Eifuku strengthens the probability that while the plume from Daikoku almost certainly contributes to the particle layer in the area (see below), Eifuku is also hydrothermally active. Figure 4.3.1-2 shows the particle plume (dNTU), potential density contours, CTD tow trackline, bottle sample positions (□) and ORP anomalies during T14B-02 at Eifuku.

Daikoku: Daikoku was selected as an alternate site for the Flux Experiment based on the previous intensity of plumes seen there and the likelihood that activity at Daikoku may have been contributing to the plume seen over Eifuku 11 km away, implying Daikoku was robustly active. The first Flux Experiment tow [T14B-03] at Daikoku was located ~750 m north of the summit. Multiple plume layers of varying intensity at the summit depth (between ~320-420 m) all had particle, ORP and pH anomalies ($dNTU_{max}$= 0.1 to 1.0; ΔE= -50 mv; ΔpH= -0.4). The most intense layer was centered ~350 m. pH anomalies from discreet samples were much higher, reaching -0.8 pH units, probably reflecting precipitation of metal sulfides and oxidation of H_2S prior to the collection of the discreet samples. Samples taken for Total CO_2 will help resolve this issue. Several particle layers ($dNTU_{max}$= 0.086, with no ORP or pH signals) were found below 420 m depth during the initial downcast of tow T14B-03 to the west and slightly north of the summit. The intense layers over the summit along with multiple deep particle-only layers suggested Daikoku was actively erupting. Bathymetry differences (see multibeam mapping section), bubble plumes (see EM122 mid-water data section) and unusually high hydrogen concentrations in the discreet samples confirmed an active eruption in progress. The second Flux Experiment tow [T14B-04] was positioned to the west and ~300 m downstream of the summit (see ADCP current monitoring section). Figure 4.3.1-3 shows the particle plume (dNTU), potential density contours, CTD tow trackline, bottle sample positions (□), ORP and pH anomalies from tow T14B-03. The fully shaded area is the bathymetry profile under the tow trackline, the semi-transparent area is the

bathymetry profile across the summit of Daikoku along a line parallel to the tow trackline. Figure 4.3.1-4 shows the particle plume (dNTU) from tow T14B-04 relative to the new, larger crater at the summit of Daikoku.

Launching of CTD instrument over Ahyi seamount.

Figure 4.3.1-1 Ahyi T14B-01

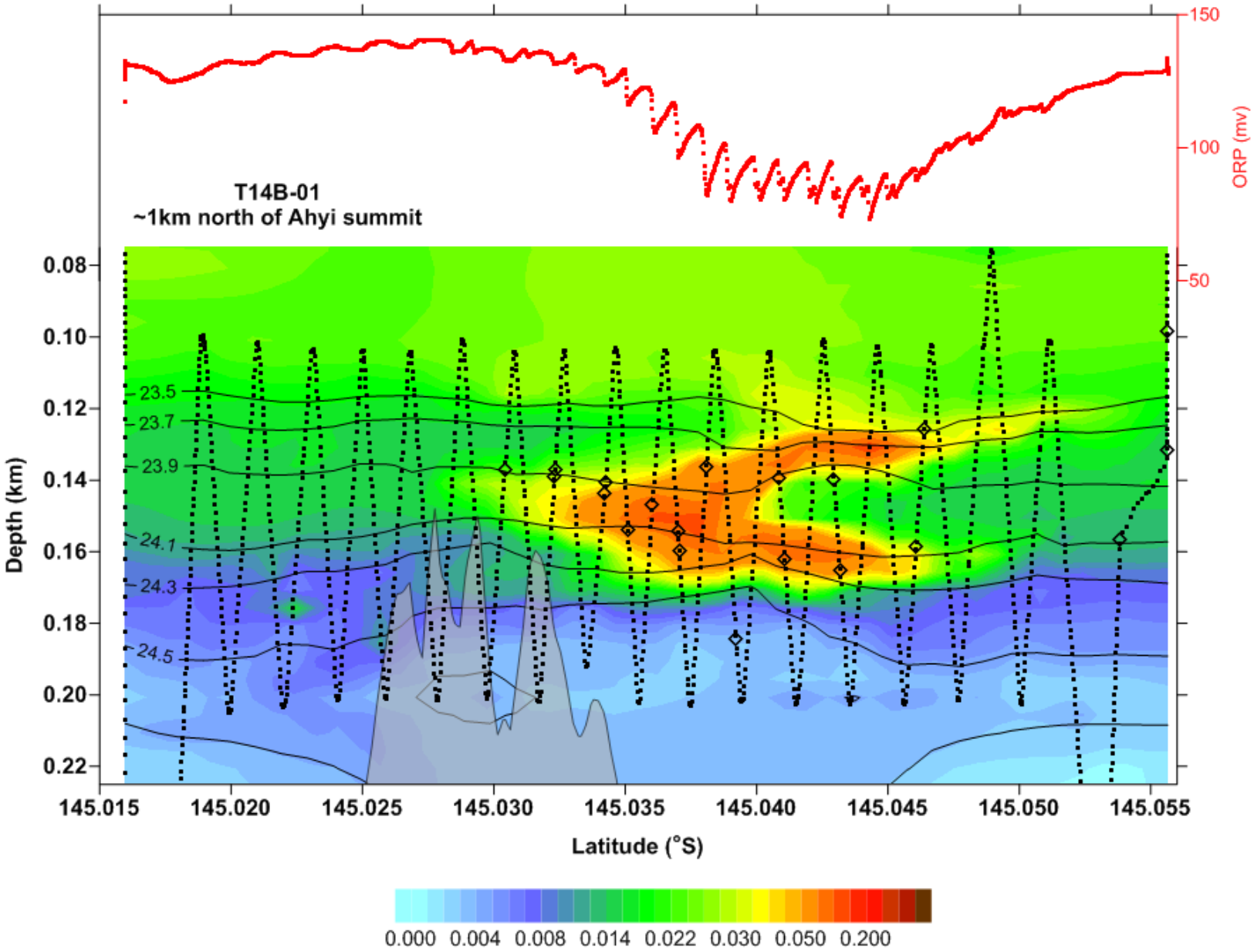


Figure 4.3.1-2 NW Eifuku T14B-02

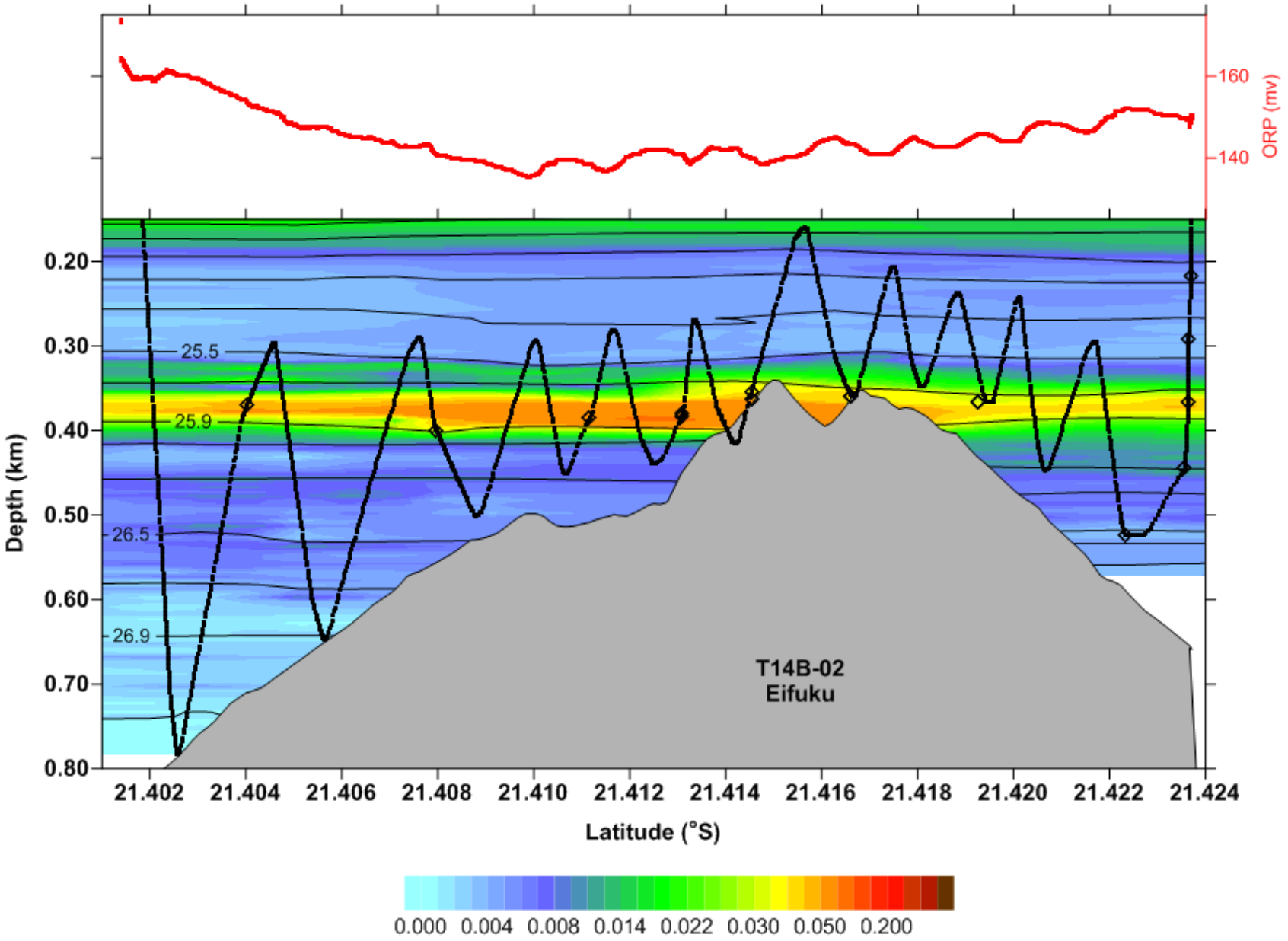


Figure 4.3.1-3 Daikoku T14B-03 (west of summit).

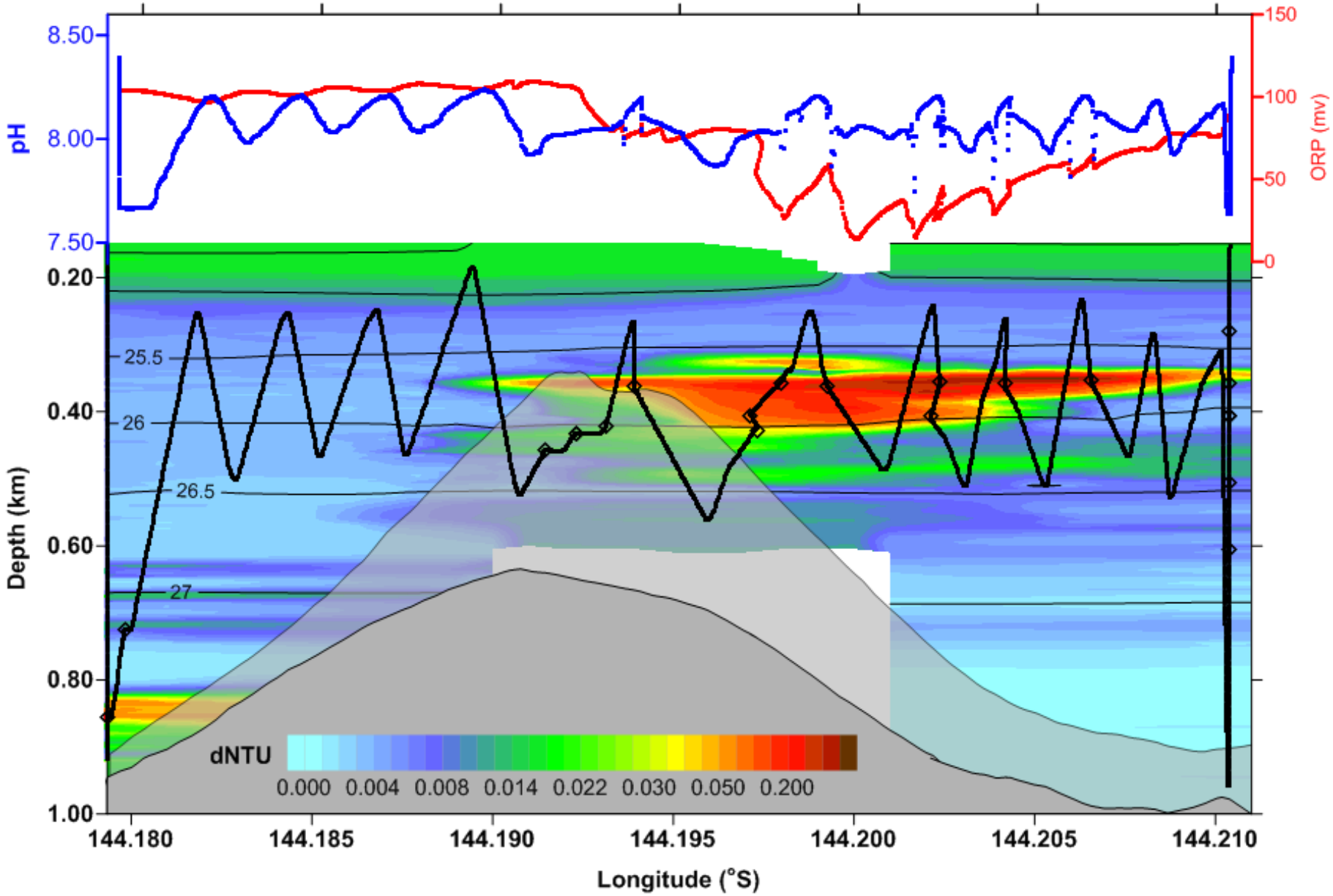
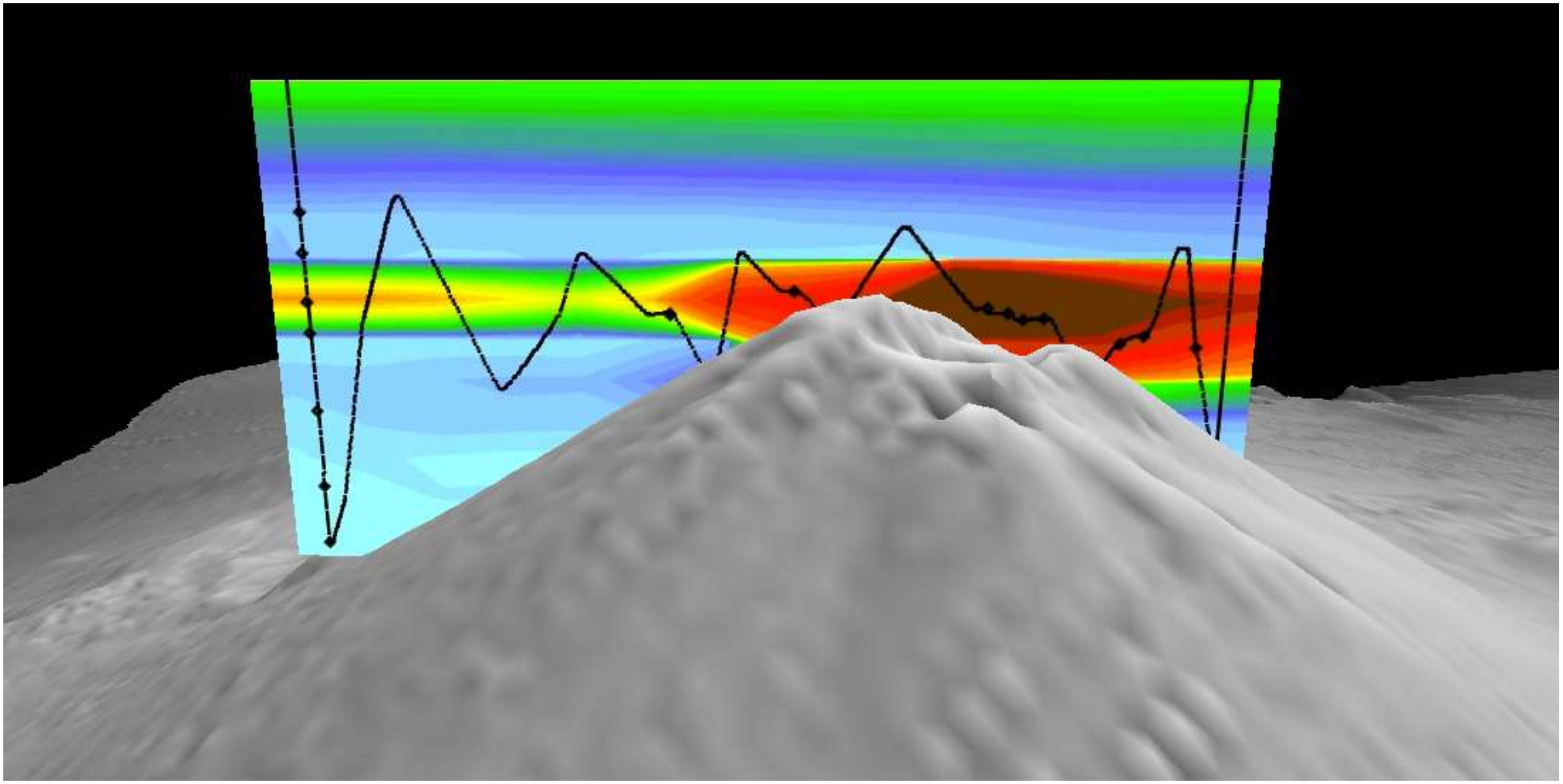


Figure 4.3.1-4 Daikoku T14B-04 relative to the summit of Daikoku.



4.3.2 Acoustic Doppler Current Profiling

Joe Resing and Nathan Buck (NOAA/PMEL/EOI UW/JISAO)

The R/V Revelle's RDI 75KHz Acoustic doppler current profiling (ADCP) provided measurements of ocean current velocities and directions (vectors). ADCP data were collected during the cruise to provide an understanding of the oceanic currents in the region of the Mariana Arc to aid in our understanding of the near and distal fate of hydrothermal plumes. We used these data in real-time in conjunction with towed CTD casts to enable chemical fluxes from shallow island arc volcano systems of the Marianas to be estimated. The ADCP data also provide better understanding of regional currents, and, when combined with regional scale circulation models, will enable us to predict the long range transport of the hydrothermal effluent from the arc.

The RDI 75KHz ADCP that was operated in narrowband mode. Current data was collected for the duration of the cruise using the University of Hawaii data acquisition system (UHDAS), a suite of programs developed by the University of Hawaii's Currents program, which performs at sea data acquisition, processing and monitoring. Post processing was done using a collection of python data processing packages and strict procedures called 'CODAS processing,' which were also developed and distributed by the UH Currents program. Further details concerning ocean currents data can be found at the Joint Archive for Shipboard ADCP (http://ilikai.soest.hawaii.edu/sadcp/) which "is responsible for the acquisition, review, documentation, archival and distribution of shipboard ADCP sets."

Current profiles typically reached a maximum depth of ~625 meters, were processed to 5 minute averages and 16 meter depth bins. Final processed data were extracted as NetCDF files using COADS conventions and provide x, y, z, u and v as well as ancillary parameters such as latitude, longitude, time ship speed, etc .

Currents were assessed during the cruise to determine the most likely location of hydrothermal plumes originating from potentially active volcanoes and for selecting sampling locations for CTD operations. Specifically CTD tows were conducted at a heading roughly perpendicular to the current direction – a sampling strategy which should optimize chemical flux estimate calculations. Figures 4.3.2-1 and 4.3.2-2 display transects for CTD tows conducted at Ahyi (T14B-01) and Daikoku (T14B-03) volcanos, respectively. Arrows represent five minute averages of current direction and magnitude averaged over the plume depths. The corresponding towed CTD data can be seen in (Figures 4.3.1-(1-4)).

At Ahyi the hydrothermal plume was found from 100 to 175 m depth where currents averaged 0.23 m/s at a direction of 25 degrees over the time interval of the CTD tow (Figures 4.3.2-3). At Daikoku average currents at the plume depths, 320 – 420 m, were 0.165 m/s at a direction of 21 degrees. (Figures 4.3.2-4)

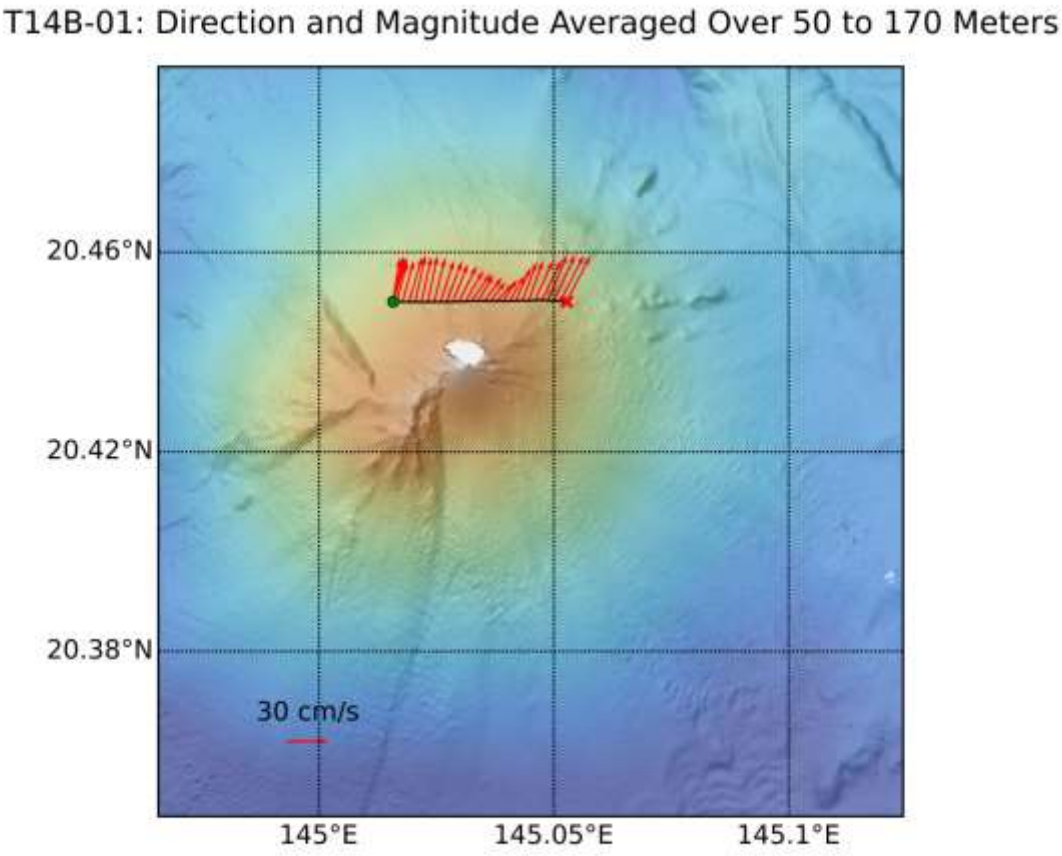


Figure 4.3.2-1. CTD tow transect for Ahyi towyo T14B-01. The green dot and red X represent the transect beginning and ending points, respectively. The red arrows represent average current direction and magnitude over observed plume depths, in this case 50 to 170 meters.

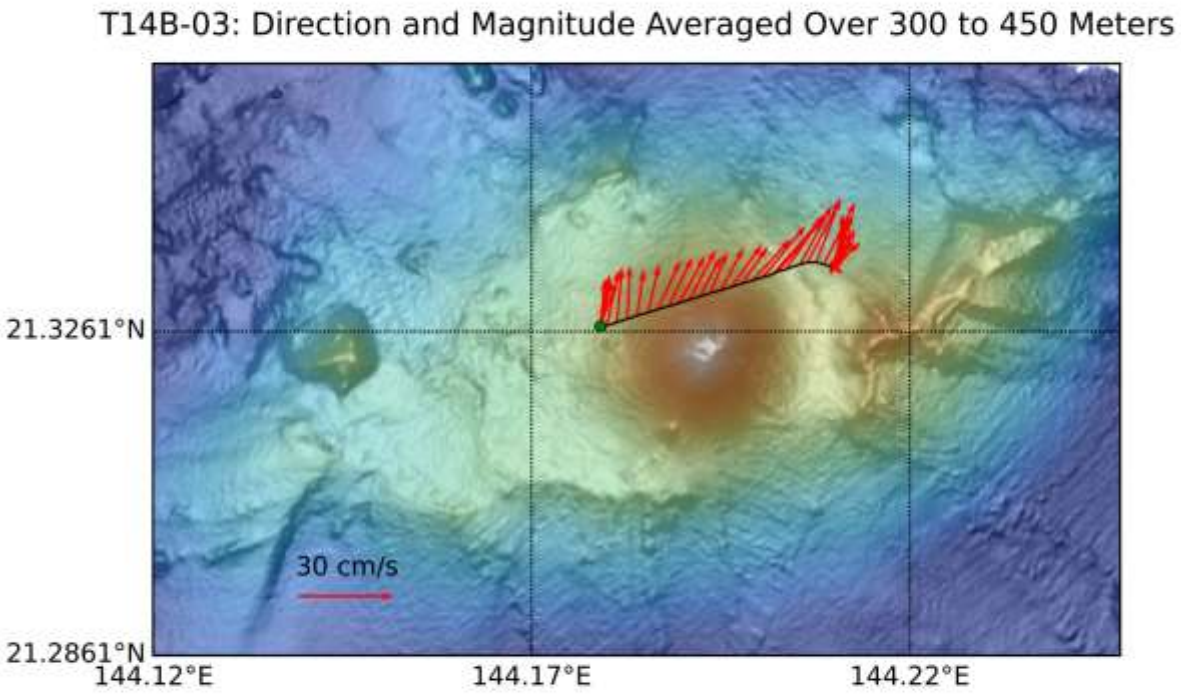
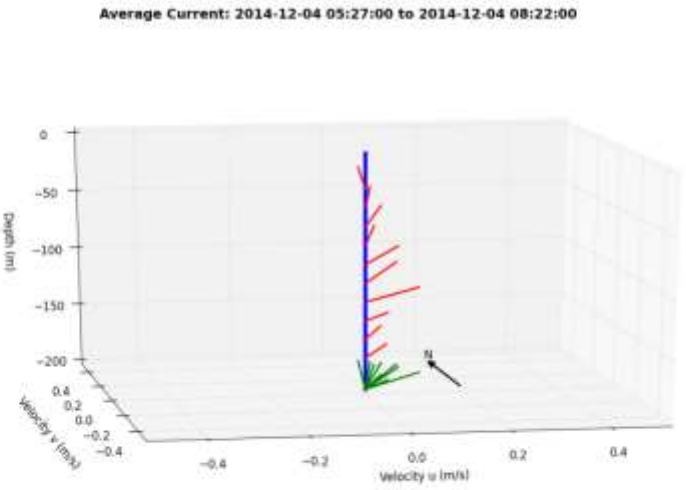


Figure 4.3.2-2. CTD tow transect for Daikoku towyo T14B-03. The green dot and red X represent the transect beginning and ending points, respectively. The red arrows represent average current direction and magnitude over observed plume depths, in this case 300 to 450 meters.

A



B

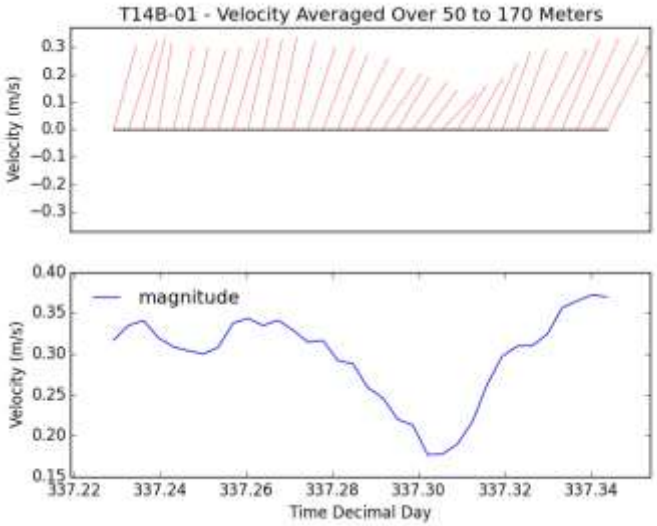


Figure 4.3.2-3. **Average currents during time the interval of towed CTD operations around the summit of Ahyi Submarine volcano** (Tow T14B-01)**.** A. Current direction and magnitude at different depth intervals between 16 and 192 m. The red bars show velocity and direction of currents binned at 16M intervals, green bars show the projections of the red bars onto the bottom of the plots to aid in visualizing directions. B. Average current velocity and direction over 50 170m depth interval and broken into 5 minute time bins during the time interval of the CTD tow. Red bars represent current direct and have a length relative to total magnitude (m/s).

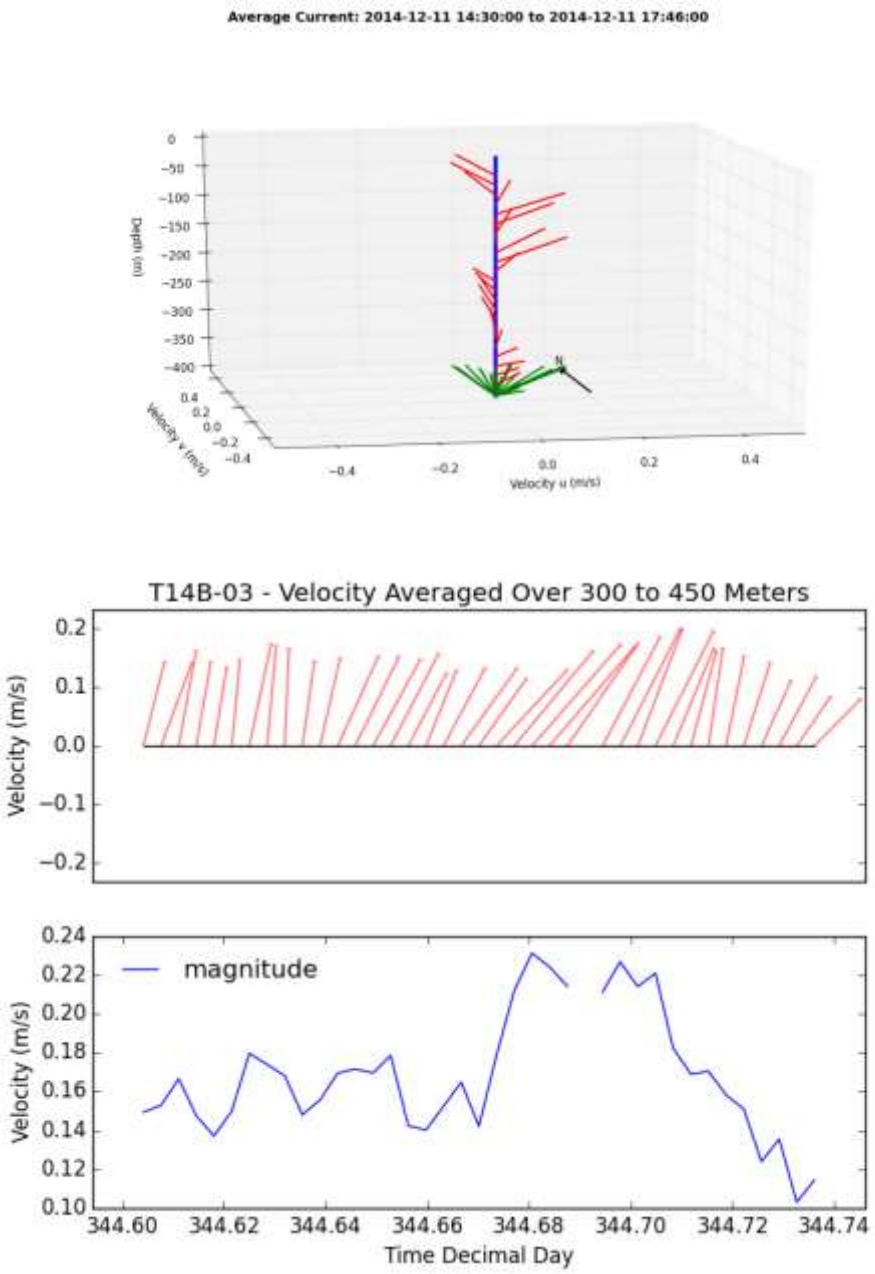


Figure 4.3.2-4. **Average currents during time the interval of towed CTD operations around the summit of Ahyi Submarine volcano** (Tow T14B-01)**.** A. Current direction and magnitude at different depth intervals between 16 and 400 m. The red bars show velocity and direction of currents binned at 16M intervals, green bars show the projections of the red bars onto the bottom of the plots to aid in visualizing directions. B. Average current velocity and direction over 300 to 450m depth interval and broken into 5 minute time bins during the time interval of the CTD tow. Red bars represent current direct and have a length relative to total magnitude (m/s).

4.4 Geology/Mapping

Bill Chadwick (NOAA/PMEL/EOI – OSU/CIMRS)

Geologic observations during this cruise included visual observations during the ROV dives, high-resolution Reson multibeam sonar data collected with Jason at NW Eifuku seamount, and the EM122 multibeam sonar data collected by the ship (both repeat mapping of selected sites to look for depth changes, and collecting bathymetric data in new areas, such as the Mariana back-arc). Many of our geology goals for the cruise were not achieved because of the problems we had with weather and the Jason cable, which severely limited our ROV dive time.

NW Rota-1
When we first arrived with the ship at NW Rota-1, we did not have time for a Jason dive, because a typhoon was passing south of Guam and we had a very limited weather window. So we conducted a CTD cast and a bathymetric re-survey of the seamount. The CTD cast showed only a very weak hydrothermal plume and the repeat bathymetry showed very little depth change since the previous survey in March 2010, suggesting that the eruptive activity must have shut down soon after that visit, and that the volcano has probably been quiet since then. Amazingly, it had been active during all previous visits between 2003-2010, and this was the first visit when it was not. When we returned on our way back south we were able to fit in a short Jason dive (J2-800) – much abbreviated due to weather – which confirmed that NW Rota-1 seamount was indeed no longer volcanically active, although it was still hydrothermally active. During the Jason dive we traversed from west to east and visited the vicinity of the five eruptive vents that were active in 2010, then the Iceberg area and finally further east to the Fault Shrimp area. There was clear evidence for new pillow lavas near the Phantom and Charon eruptive vents, that had clearly been erupted since our last visit in March 2010 (but probably soon after that). It was hard to recognize the other eruptive vents (Sulfur, Brimstone, and Styx), but we surely passed nearby. Phantom and Charon vents had milky diffuse hydrothermal effluent coming from them and were surrounded by lots of vent animals, which was new. In fact, it was striking how much the NW Rota biological species has spread since 2010 in the absence of volcanic activity. In particular the Alvinocaris shrimp and the limpets had greatly increased their populations and areas of colonization. We had intended to collect a Reson multibeam sonar survey of the summit of NW Rota-1 to compare with earlier high-resolution surveys, but we were not able to due to the weather only allowing us one short dive.

NW Eifuku
A somewhat systematic visual and photographic traverse was made around the Champagne vent site to better map its size and extent, but further analysis of those data are needed. It was noticeable that the high-CO2 vents in the Champagne field were associated with deposits of elemental sulfur on the seafloor, and that the mussels did not colonize on the sulfur, only on surrounding rocky outcrops. During Jason dive J2-798 we conducted a Reson multibeam survey. The survey plan consisted of 8 lines, each 600 m long and at a spacing of 100 m, to be flown at an altitude of 60 m. The lines were oriented SW-NE. We started the survey at the NW-most line, but unfortunately we were only able to finish 3 lines before the dive had to be aborted due to weather. We were not able to resume the survey later, so only a partial survey was collected. The 2014 Reson partial survey seems to agree pretty well with our previous lower-resolution Imagenex sonar survey collected with the ROPOS ROV in 2004.

Daikoku
After the CTD team found evidence for new eruptive activity at Daikoku seamount, we resurveyed the seamount with the ship's multibeam and found a large new crater at the summit. This new crater is in the same area where we had found two smaller craters that were investigated by the ROPOS ROV in 2004 and were mapped by Jason's SM2000 multibeam sonar in 2006. These two smaller craters were not large enough to be clearly resolved by earlier ship-based multibeam sonar. The new larger crater seems to have engulfed the two smaller ones and occupies much of the summit.

Ahyi
We collected a bathymetric resurvey with the ship at Ahyi seamount, because it erupted in April-May 2014. One bathymetric line was collected by the NOAA ship Hi'ialakai in May, which revealed major depth changes at the summit, but was spatially very limited. During this expedition we were able to re-survey the entire seamount, which will allow for a more complete analysis of the changes caused by the eruption.

Mariana back-arc
On our way north-to-south from the vicinity of Ahyi seamount back down to NW Rota-1 seamount, we collected multibeam sonar bathymetry in the Mariana back-arc with the R/V Revelle's EM122 system, from about 20°N to 15.6°N. We hope to be working in this part of the back-arc in future years, and this new bathymetry will be very valuable for planning and executing that work. These and other mapping results are described in the next section of this report.

4.5 R/V *Revelle* EM122 Multibeam Seafloor and Mid-Water Mapping Operations

Susan G. Merle (NOAA/PMEL/EOI – OSU/CIMRS)

Over 31,000 km^2 of seafloor were mapped with the EM122 multibeam system on board the R/V *Revelle* during the RR1413 SRoF'14 – Ironman expedition (Figure 4.5-1).

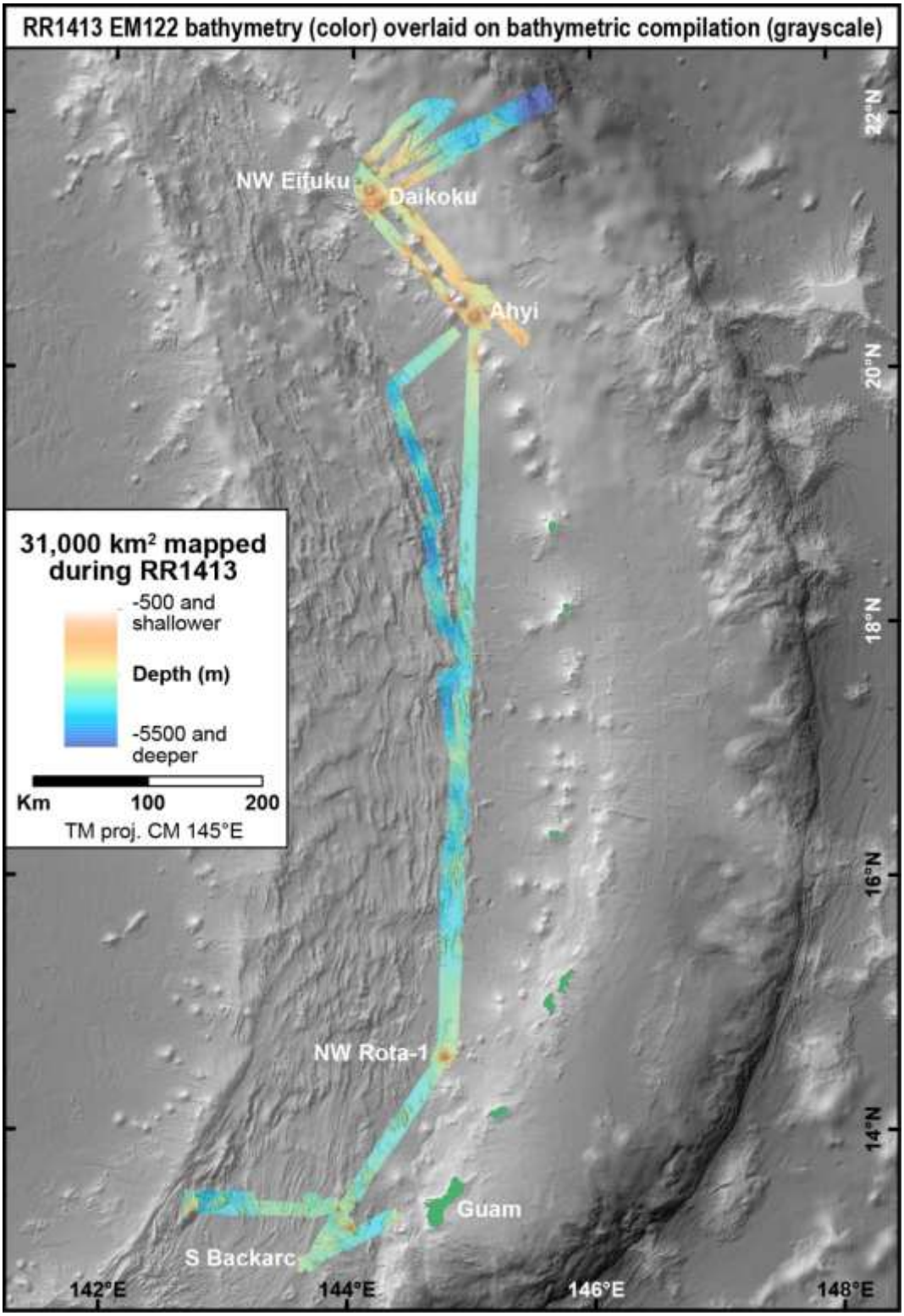


Figure 4.5-1. RR1413 EM122 bathymetry data (color data) overlaid on previous bathymetric compilation (grayscale), showing the 31,000 km2 mapped during the expedition.

EM122 multibeam bathymetry, backscatter, and mid-water data were collected during transits, while mapping specific sites, between dives, and most times during CTD operations. 261 hours of the 528 total hours of the expedition were spent logging EM122 multibeam or mid-water data. Due to weather and mechanical issues with the ROV cable, there were many instances when multibeam mapping was the only operation that could be executed. Weather also affects the quality of the bathymetry data, and unfortunately there are large segments of mapped data that are very poor quality due to bad weather (the area to the east of Ahyi is an example).

Planned Surveys (Bathymetric and Mid-Water) and Transits

After visiting the South Backarc sites (Snail and Urashima) the R/V *Revelle* headed north to NW Rota where a line was run over the seamount to look for any depth changes, and to observe the water column data that would indicate whether or not NW Rota was still active. Comparing the 2014 data with the 2010 data indicated there was very little change in the bathymetry, except possibly a small landslide just downslope of the formerly eruptive vents (Figure 4.5-2, left). The NW Rota-1 water column data did not display any eruptive vent plumes. Next a transit line was run straight from NW Rota-1 to Ahyi, collecting bathymetry on the way. At Ahyi a bathymetric survey was run over the entire seamount to use for surface differencing with previous data collected here in 2003 and 2004, because of the eruption there in April-May 2014. The NOAA ship *Hi'ialakai* ran a single multibeam line over the summit of Ahyi in May 2014, revealing depth changes due to a new eruption crater at the summit and a landslide down the southern slope. A more complete re-survey was performed on this expedition to better document those earlier results (Figure 4.5-2, right). Mid-water data showed bubble plumes rising from the summit at Ahyi, specifically out of a little pit crater near the summit (Figure 4.5-3). A full bathymetric re-survey was also conducted at Daikoku. Bathymetric changes at Daikoku since the 2003/2004 surveys were a set of new craters near the summit, consistent with the CTD evidence for renewed eruptive activity there (Figures 4.5-4 and 4.5-5a). There were also plumes evident (at least 2) in the mid-water data in the area of the new craters and beyond (Figure 4.5-6a, 4.5-6b). The mid-water data also imaged the liquid CO_2 bubbles rising from the seafloor at NW Eifuku (Figure 4.5-6c). After finishing up with the ROV dives at NW Eifuku, a multibeam survey was conducted down the axis of the back-arc from 20.0° to 15.6°N.

Other Data Quality Issues

In addition to bad weather and high seas degrading the quality of the bathymetry data, there appeared to be some inherent problems with the EM122 system on the R/V *Revelle* as well. There was some discussion with the marine technician at sea regarding the system calibration numbers entered by Scripps technicians, and whether or not the values were given the proper sign (positive or negative). There are actually 2 sets of values that are entered into the calibration: transducer offsets and MRU (motion sensor) offsets. Those issues have not been resolved at this point. The data often exhibit a washboard appearance, especially on the outer edge of the swaths. Where tracks overlap the data look worse as well – magnifying the outer edge artifacts (Figure 4.5-5b). There were also instances when a large number of beams near nadir displayed no depth values, thus creating a hole in the data near nadir. The NW Rota-1 survey show those data gaps. Those nadir data gaps are also apparent in a good portion of data collected along the back-arc. All those problems with the data quality were exacerbated when the weather was bad, possibly because the increased ship motion was not properly being corrected for by the system.

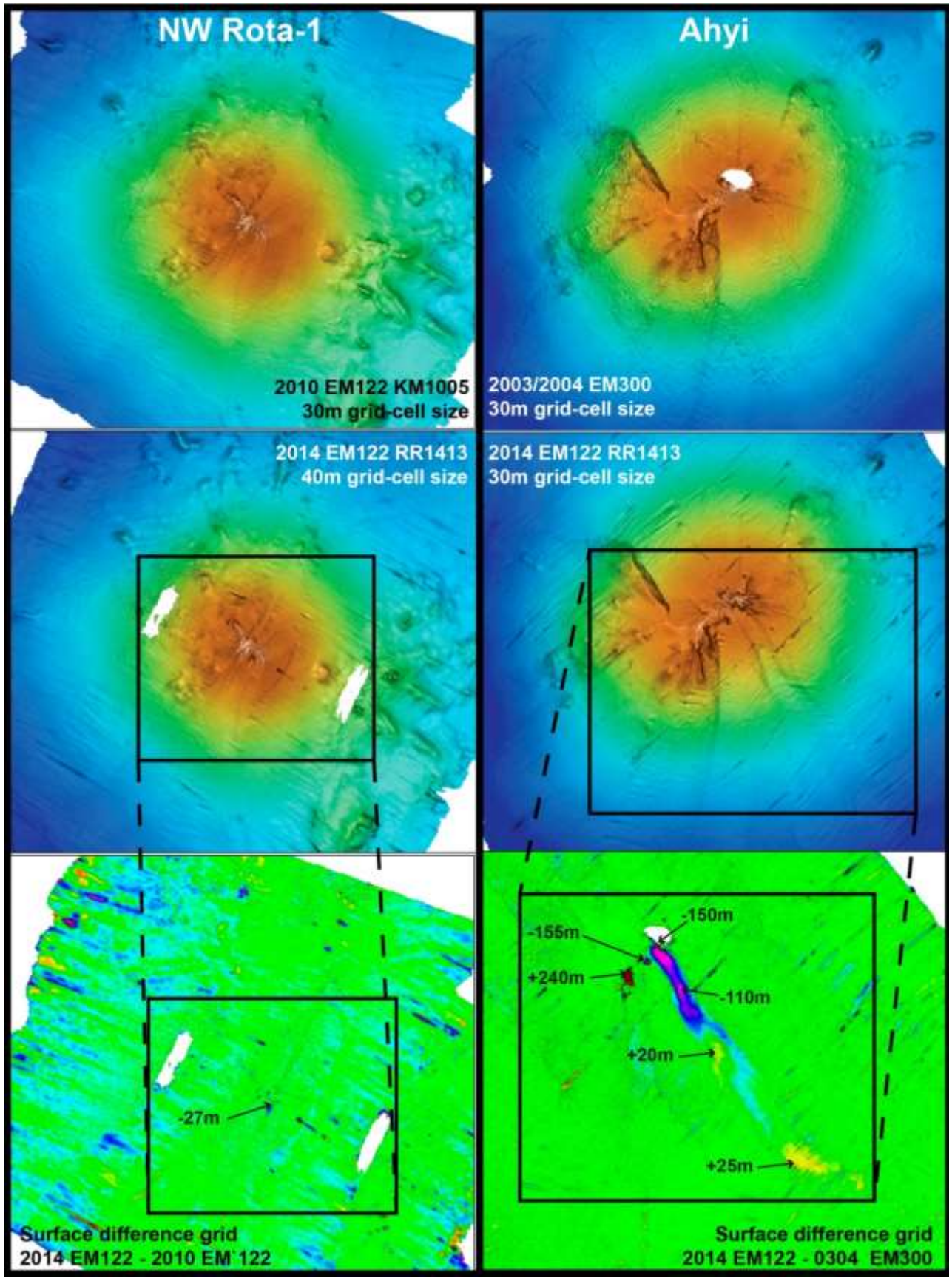


Figure 4.5-2. Bathymetric comparisons showing depth changes at NW Rota-1 (left) and Ahyi (right). EM122 data from the RR1413 expedition were compared to previous surveys to create the surface difference grids at the bottom of the figure.

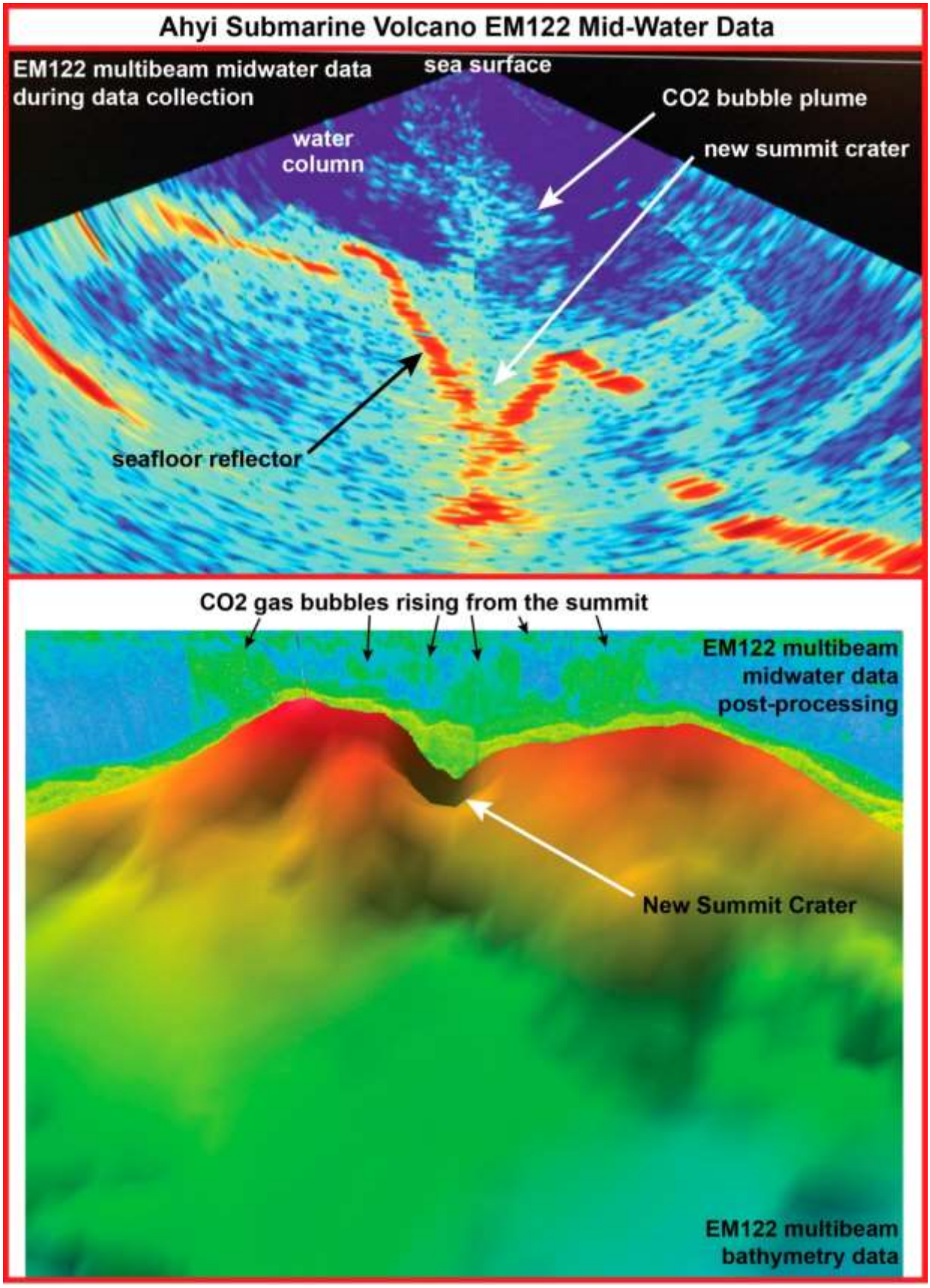


Figure 4.5-3. EM122 mid-water data collected on RR1413 at Ahyi seamount. Top image shows seafloor and midwater data during collection, the bottom image shows the data post-processed. The new crater created by the April 2014 eruption is visible in both images, as well as the CO_2 bubbles rising from the summit.

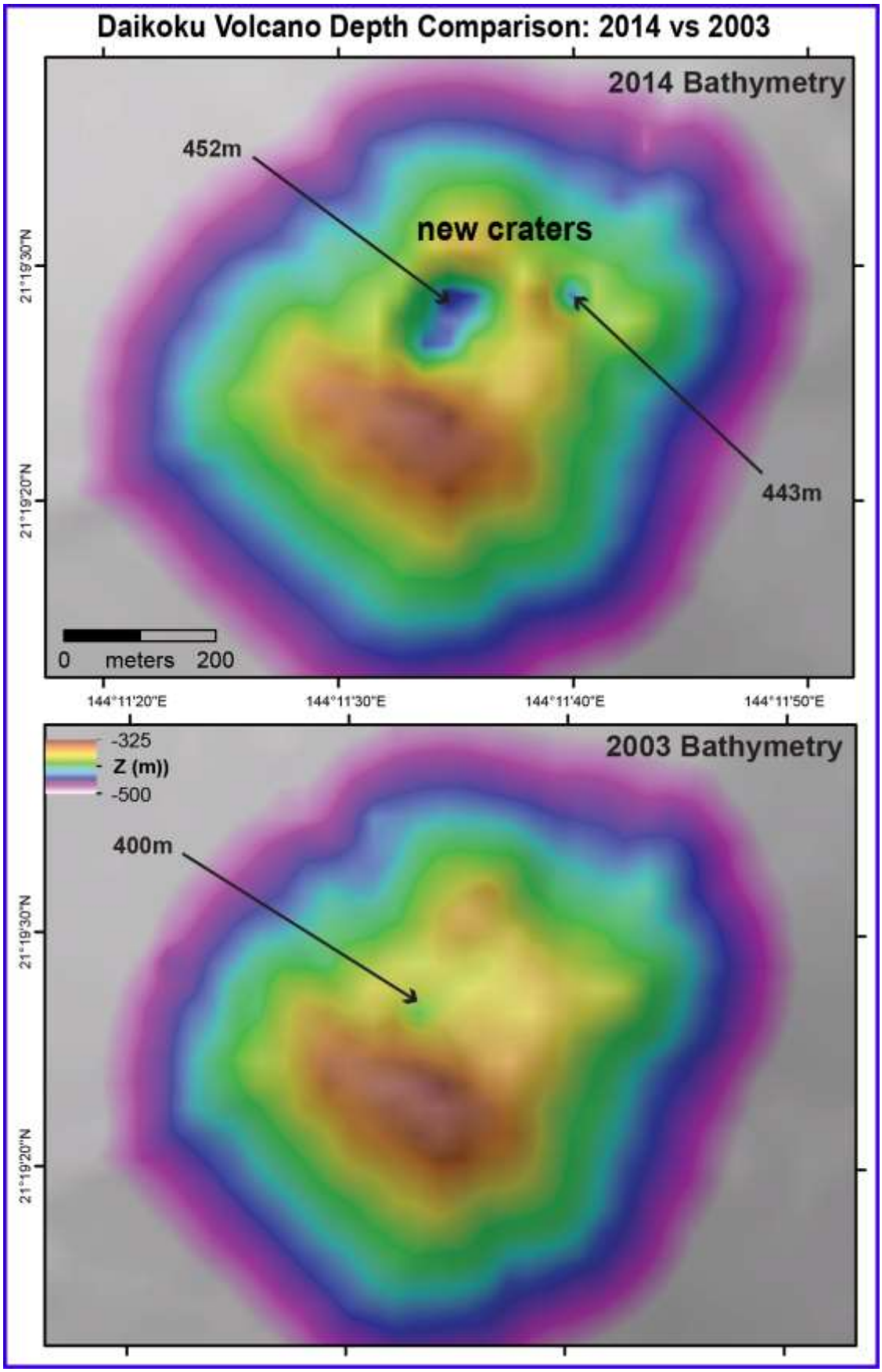


Figure 4.5-4. Bathymetric changes near the Daikoku summit since the 2003/2004 surveys. The largest of the two craters was the site of two distinct smaller craters explored during ROV dives in 2004 and 2006 but it is now much wider and deeper.

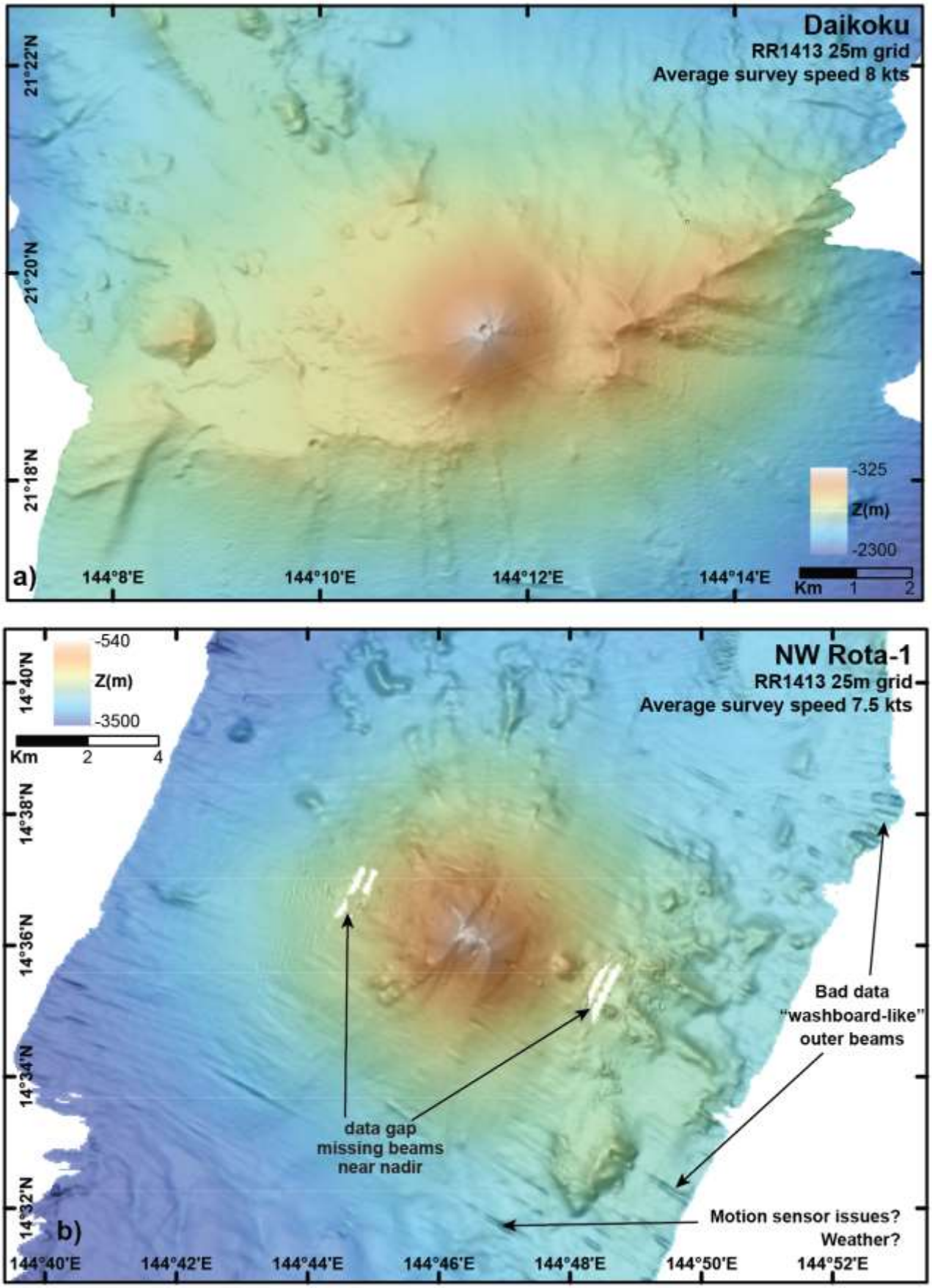


Figure 4.5-5 . (a) The entire bathymetric survey at Daikoku. (b) The entire bathymetric survey at NW Rota-1, highlighting some of the bathymetric data quality problems encountered on the expedition.

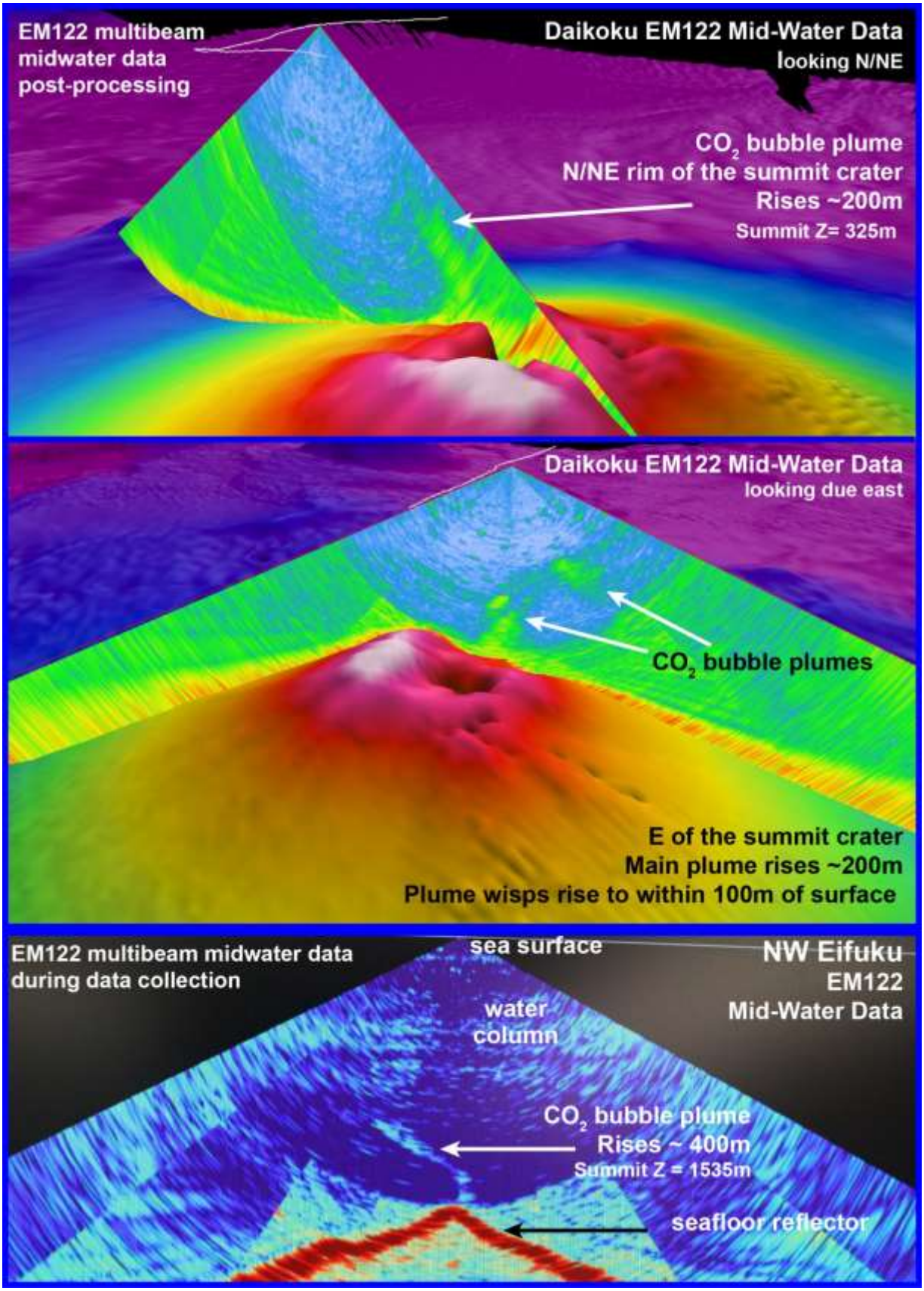


Figure 4.5-6. (a, b) Processed mid-water data at Daikoku showing the 2 separate areas of venting at/near the summit. c) NW Eifuku midwater data during collection. The CO2 bubble plume can be seen ascending from the summit area.

4.6 Moorings

Matt Fowler (NOAA/PMEL/EOI – OSU/CIMRS)

NW Rota-1 is a seamount that has been volcanically active in the recent past. NOAA/OSU hydrophones have proven very successful for monitoring and detecting undersea volcanic activity, and therefore were selected to monitor the current volcanic activity of NW Rota. The sensor array was deployed at the beginning of the 3 week cruise with the intention of recovery and redeployment at the end of the cruise. The plan was to download the initial data from the hydrophone to determine if Rota was still active, redeploy the hydrophone with 3 MAPRs, without the ADCP, to then be recovered at a later date, sometime in 2015, leaving a longer term monitoring system in place.

Deck Operations:

The initial deployment went well, in calm seas and fair weather. This sensor array was deployed on an untested hybrid mooring consisting of a 37" spherical syntactic foam float, 20m of ¾" nylon, a 50m 5/8" wire rope, the Autonomous Underwater Hydrophone (AUH), a 62m 5/8" wire rope, the Acoustic Doppler Current Meter (ADCP) mounted inside a 49" spherical syntactic foam float, and a 17m wire rope all connected by acoustic release to the 2400 lb anchor, a stack of three railroad wheels. The hydrophone had never before been deployed with an ADCP also on the mooring and inadvertently became the "weak link" between the two flotation systems. Additionally, there were 4 MAPRs mounted on the wire, 3 between the float and AUH and 1 between the AUH and the ADCP. Utilizing the 1 kt. surface current, the R/V Revelle setup a short distance from the anchor drop point, and maintained position while the mooring was allowed to stream behind in the current. The mooring was deployed float first, anchor last. The anchor was allowed to freefall 630m to the seafloor. When the ADCP was deployed, the weight of the hydrophone positioned between the ADCP and top float caused the two floats to move closer together. As the total mooring line between the 'phone and float was 70m (20m nylon + 50m wire rope) and the line between the 'phone and ADCP was 62m, the weight of the phone kept the line to both floats tensioned and the 1 kt. current prevented entanglement. When the mooring had been deployed but the anchor was still aboard, the R/V Revelle approached the anchor drop site with the mooring stretched out behind the ship. At the correct position the anchor was deployed and the anchor landed on the sea floor in the target location. The hydrophone logged data for the entire 2 week deployment period and all instruments were successfully recovered with good data.

During the recovery the hydrophone was damaged and was not redeployed as planned. Recovery of the instrument was conducted while conditions were fair, with 5-7 ft. seas and a surface current of ~1kt. The bridge maintained a 1.25 to 1.5 kt. speed through the water during the recovery operations. After capture and recovery of the 37" top float, the design flaw of the mooring manifested itself when the excessive drag created by the 49" spherical syntactic foam float containing the ADCP began to place extreme tension on the hydrophone itself. For several minutes, the mooring was stretched so tight the hydrophone was out of the water, nearly horizontal, while the 50m wire rope was recovered. This was exacerbated by the delays caused while removing each of the MAPRs from the wire rope. Use of a travelling block, suspended from the 7-8m tall A-frame to a height of ~2-3m above the deck may have also been a factor in this over tensioning by creating a nearly straight line between the instrument and the capstan recovering the line. During most of this time, the hydrophone remained out of the water, horizontal, due to the drag created by the 49" ADCP float at the end of the 62m wire rope. Intermittent shock loading was also occurring due to the 5-7 ft. swell. After the hydrophone was recovered, the ADCP and acoustic release recovery went normally without any issues.

The hydrophone pressure housing was opened up, data downloaded, and the instrument was re-initialized and readied for redeployment. During the torque sequence of the pressure housing end cap, a 3/8" x 16 Titanium bolt broke when only 15 lbs. of force was applied. It was determined the bolt had been damaged by the excessive stress created by the combination of tension and shock loading of the mooring line. The other 7 Titanium bolts that mount the end cap to the pressure housing are also considered compromised. There were no replacement bolts available and the instrument could not be redeployed.

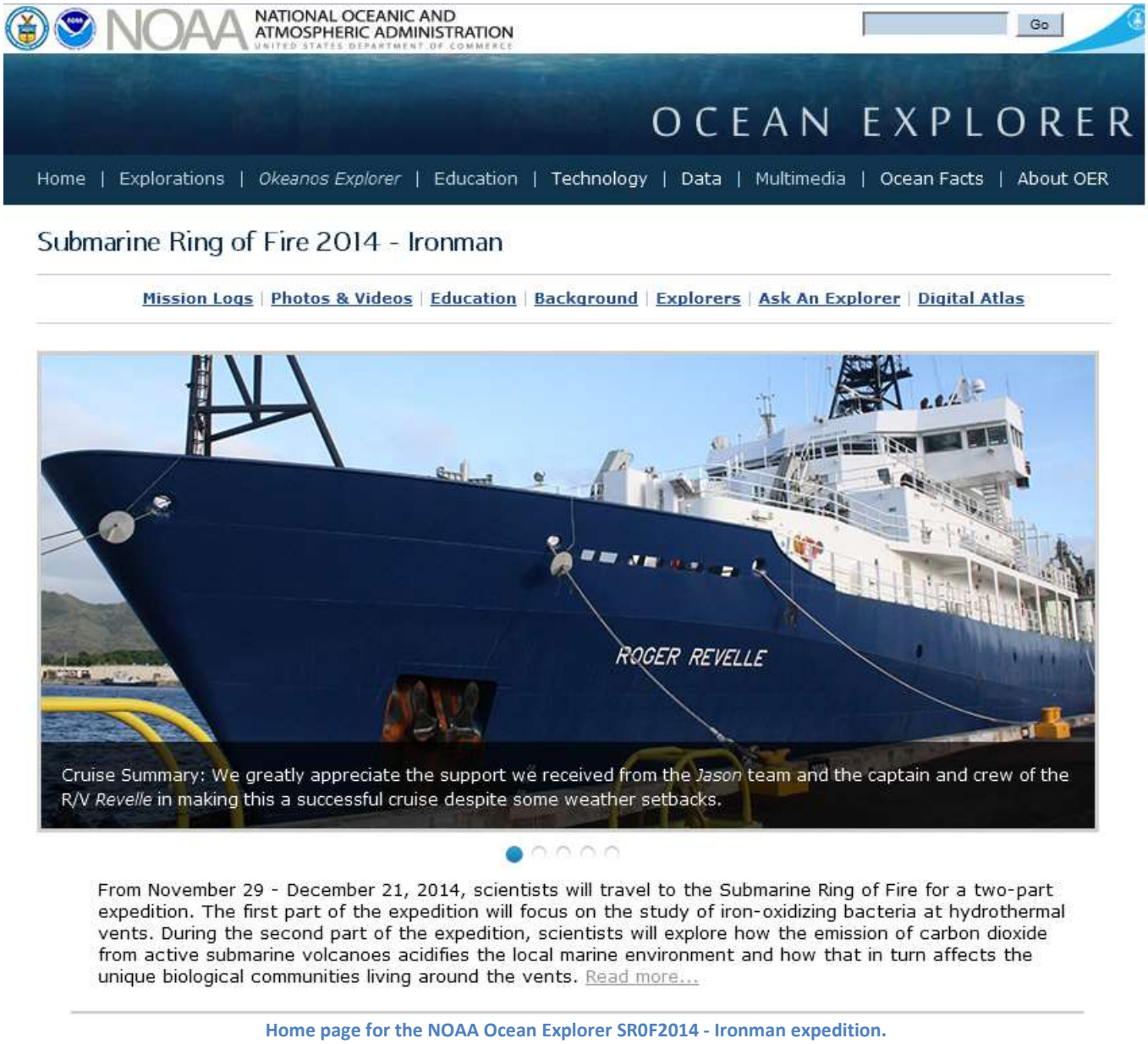
4.7 SRoF2014 – Ironman Outreach

Bill Chadwick (NOAA/PMEL/EOI – OSU/CIMRS)

The NOAA Ocean Exploration and Research (OER) Program hosted a web site that followed the SRoF2014 – Ironman expedition at this URL:

http://oceanexplorer.noaa.gov/explorations/14fire/

Before the cruise, background pieces were posted about the overall goals of the cruise, the seamounts that we planned to visit in the Mariana arc, and background information about the macrobiology and microbiology of the sites. A NOAA Ocean Exploration Webinar for Educators was conducted on November 12 (~3 weeks before the cruise started) to inform and engage teachers about the expedition, which included a short overview of the cruise by me, followed by a description of what education and outreach materials would be available on the OER web site. During the cruise, we posted 13 Mission Logs describing our activities during the expedition featuring text, images, and a total of 19 videos created by our videographer, Saskia Madlener. We had great support from the OER web team (Emily Crum and James Rawsthorne) and the OER education team (Susan Hayes, Melissa Ryan, and Paula Keener). Kasey Cantwell coordinated the outreach and education efforts for OER.

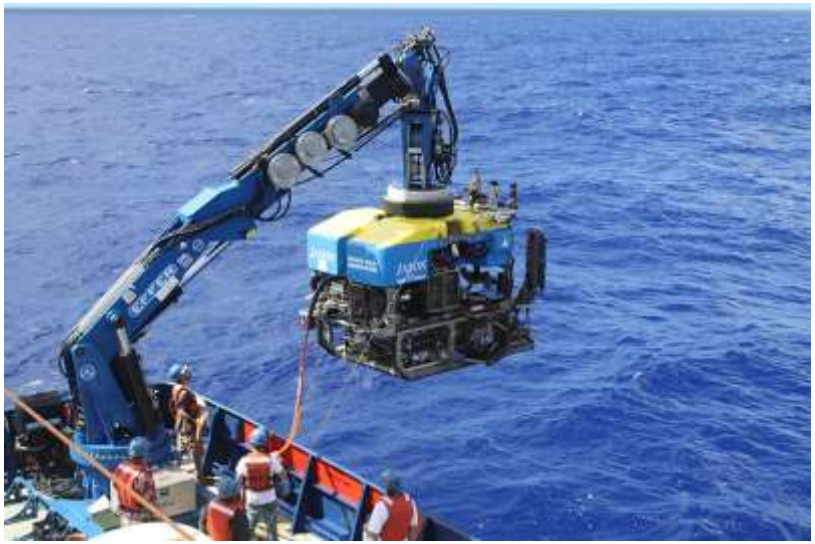


Home page for the NOAA Ocean Explorer SR0F2014 - Ironman expedition.

5 - JASON

5.1 Dive Statistics

Lowering	Start/Launch	On Bottom Start Data	Off Bottom End Data	End/On Deck	Line/Area/Site	Bottom Time (Hrs:Mns)	Jason in Water (Hrs:Mns)	
J2-797	2014/11/30 03:20	2014/11/30 05:30	2014/12/01 12:08	2014/12/01 14:16	Snail and Urashima	30:38	34:56	
J2-798	2014/12/04 22:34	2014/12/04 23:42	2014/12/06 07:14	2014/12/09 04:10	NW Eifuku	31:32	101:36	*
J2-799	2014/12/13 12:11	2014/12/13 13:18	2014/12/13 20:04	2014/12/13 21:35	NW Eifuku	6:46	9:24	
J2-800	2014/12/16 20:44	2014/12/16 21:25	2014/12/17 04:26	2014/12/17 05:08	NW Rota-1	7:01	8:24	
J2-801	2014/12/17 16:08	2014/12/17 17:59	2014/12/18 06:39	2014/12/18 08:35	Urashima	12:40	16:27	
					TOTAL:	88:37	*Jason/Medea towed ~3 days until better weather	



5.2 Dive Imagery (stills/video)

Automated Video Recordings 1047 clips (610GB) plus 702 clips (416GB) from backup recorder. Three 1080i camera streams (brow camera, pilot camera, science camera) were recorded to hard drive- based video files. These are MPEG Transport Stream (.ts) files compressed (output rate was 6000 kbps) using the h.264 codec. Image resolution is 1920x1080 pixels. These are playable using open source video players such as *VLC*, *mplayer,* or *totem.* Filenames include camera name and start timestamp. Automated clip duration was set at 15 minutes.

High Definition video highlights 172 clips (414GB). This cruise made direct- to- hard disk recordings of important moments from high definition video. The *Jason* data processor copied them to hard drives provided by the chief scientist. He also renamed the clips so that they indicate lowering ID, start time, and stop time. A summary listing of the clips is in the metadata spreadsheet document and in Table 5.2-1. The recordings were compressed in real time using the *ProRes422* family of codecs. They can be played back on a computer using video player software: examples include *QuickTime* player, *VLC,* and appropriately compiled versions of the open source software *mplayer*. They can be edited using *Final Cut* from Apple or *Adobe Premiere.* The recording includes time code that is synchronized to the same time reference as the other logging computers in the *Jason* system. Post-processing guidance is offered in a white paper SJM Page 3 12/19/14 (Morin, 2010) that is available on the NDSF web site. The camera used during your cruise was an Insite Mini--- Zeus. "HD Stills and Video Enhancement Techniques for the NDSF HD Camera Using Photoshop and Final Cut", M. Morin, http://www.whoi.edu/page.do?pid=51119

HDgrabs 16575 still images comprising 101.9 GB. *Jason* now offers frame captures from a selectable variety of sources, primarily Insite Mini- Zeus cameras SciCam, BrowCam, and PilotCam. Two frames from different sources can be captured concurrently. The image is a frame captured from a 1080i video stream. It uses the RGB color space model with 8 bits of quantization per primary color, and its dimension is 1920x1080 pixels. It is stored in TIFF file format. Image filenames include the capture time to support synchronization of the image to the timestamps in *Jason's* other logs.

DSC (Digital Still Camera) 361 images . During lowering J2- 797 the legacy Insite Scorpio digital camera (Nikon Coolpix 995) was employed. The resulting images were placed in this directory. The image filenames include the capture timestamp. The images are 2048x1536 pixels x 8 bits and are in JPEG format.

SuperScorpio Digital Still Camera 4499 images. This camera was placed on *Jason's* basket in a downlooking configuration. It is based on a Sony HDR-CX560V video camera recorder, which produces still images at 4672x2628 resolution. Images were renamed according to the timestamp imbedded in the exif fields of individual photos.

Table 5.2-1 HD Video Highlights

Dive	Filename (renamed)	Camera	Begin	End	Notes
J2-797	J2-797_20141130061937-20141130062132.mov		2014/11/30 6:19:38	2014/11/30 6:21:32	Beaulieu settlement plates #5
J2-797	J2-797_20141130064413-20141130064548.mov		2014/11/30 6:44:00	2014/11/30 6:45:00	fluid venting sci cam
J2-797	J2-797_20141130064633-20141130064834.mov		2014/11/30 6:45:00	2014/11/30 6:48:33	crabs and venting pilot cam
J2-797	J2-797_20141130074540-20141130074726.mov		2014/11/30 7:45:40	2014/11/30 7:47:48	highlighted not much on the sci cam
J2-797	J2-797_20141130075529-20141130075844.mov	SciCam	2014/11/30 7:55:00	2014/11/30 7:58:44	picking up Stace's #5. Totally black! Pilot cam
J2-797	J2-797_20141130083157-20141130083646.mov	PilotCam	2014/11/30 8:31:00	2014/11/30 8:36:46	marker #108, area of past venting and iron mats, sci cam
J2-797	J2-797_20141130083926-20141130084052.mov	SciCam	2014/11/30 8:39:27	2014/11/30 8:40:52	poking a yellow iron mat (sci cam)
J2-797	J2-797_20141130092048-20141130092249.mov	SciCam	2014/11/30 9:20:49	2014/11/30 9:22:49	highlight of brow cam of sampling HFS (samples #4)
J2-797	J2-797_20141130103503-20141130103730.mov	BrowCam	2014/11/30 10:35:04	2014/11/30 10:37:34	biomat sampler, sample syringe 5
J2-797	J2-797_20141130113453-20141130113536.mov	PilotCam	2014/11/30 11:34:54	2014/11/30 11:35:30	areas of bright yellow mat in shimmering water, odd configuration, hollow cavity
J2-797	J2-797_20141130114231-20141130115045.mov	SciCam	2014/11/30 11:42:32	2014/11/30 11:50:45	biomat sampler, sample A- syringe 2-4, dumping 5,
J2-797	J2-797_20141130120803-20141130121019.mov	SciCam	2014/11/30 0:08:04	2014/11/30 0:10:41	Biomat sampler, D
J2-797	J2-797_20141130121149-20141130121443.mov	SciCam	2014/11/30 0:11:50	2014/11/30 0:14:42	Biomat sampler- D1, 6,
J2-797	J2-797_20141130133206-20141130133213.mov	PilotCam	2014/11/30 13:32:06	2014/11/30 13:34:06	temperature probe around high T venting with lots of shrimp; may not have gotten this video. It seems to have stopped.
J2-797	J2-797_20141130133428-20141130133610.mov	PilotCam	2014/11/30 13:34:06	2014/11/30 13:36:09	temperature probe around high T venting with lots of shrimp- NOTE: may not have recorded, pull-down set to Usr2 Ch19
J2-797	J2-797_20141130150738-20141130150856.mov	PilotCam	2014/11/30 15:07:38	2014/11/30 15:08:56	Settlement plate temp (J797-Splate-2) after deployment
J2-797	J2-797_20141130150920-20141130151212.mov	BrowCam	2014/11/30 15:09:22	2014/11/30 15:12:12	Settlement plate locations (J797-Splate1; J797-Splate2) after deployment
J2-797	J2-797_20141130152444-20141130152629.mov	BrowCam	2014/11/30 15:24:46	2014/11/30 15:26:30	Settlement plate temp (J797-Splate1sma) after deployment
J2-797	J2-797_20141130153011-20141130153257.mov	SciCam	2014/11/30 15:30:34	2014/11/30 15:32:58	Panorama of Settlement plate (J797-SPlate1sma) after deployment
J2-797	J2-797_20141130173455-20141130173649.mov	BrowCam	2014/11/30 17:35:00	2014/11/30 17:36:48	Sea cucumber swimming/ dancing
J2-797		SciCam	2014/12/01 0:00:00		throwaway
J2-797	J2-797_20141201012607-20141201013022.mov	SciCam	2014/12/01 1:26:09	2014/12/01 1:30:22	First contact: area of spires, some white and iron mat, some venting - tall skinny chimneys, smoke in the background
J2-797	J2-797_20141201013707-20141201013907.mov	SciCam	2014/12/01 1:37:09	2014/12/01 1:39:07	Reconnaissance of chimney area, temp probe, T=214
J2-797	J2-797_20141201014703-20141201014910.mov	SciCam	2014/12/01 1:47:09	2014/12/01 1:49:10	close up of spicule coming out of chimney with shimmering water
J2-797	J2-797_20141201015643-20141201015826.mov	SciCam	2014/12/01 1:56:45	2014/12/01 1:58:26	close up of iron fingers and shrimp
J2-797	J2-797_20141201042955-20141201043100.mov	SciCam	2014/12/01 4:29:57	2014/12/01 4:31:00	Venting at Snap Snap
J2-797	J2-797_20141201050518-20141201050620.mov	SciCam	2014/12/01 5:05:20	2014/12/01 5:06:23	Close up of crab

Dive	Filename (renamed)	Camera	Begin	End	Notes
J2-797	J2-797_20141201050648-20141201051113.mov	SciCam	2014/12/01 5:06:53	2014/12/01 5:11:14	J797-HSF-30 Unfiltered piston 7 and palm worm and shrimps
J2-797	J2-797_20141201051601-20141201051703.mov	SciCam	2014/12/01 5:16:03	2014/12/01 5:17:04	macrofauna observations during J797-HSF-32
J2-797	J2-797_20141201053835-20141201054039.mov	SciCam	2014/12/01 5:38:38	2014/12/01 5:40:40	alvinellid polychaetes!
J2-797	J2-797_20141201055126-20141201055433.mov	SciCam	2014/12/01 5:51:27	2014/12/01 5:54:00	biomat sampling J797 BM1 C; didn't like this sample and it was ejected
J2-797	J2-797_20141201060810-20141201061029.mov	SciCam	2014/12/01 6:08:11	2014/12/01 6:10:29	biomat sampling J797 BM1 C5; sulfur under the iron mat; didn't like this sample either. Ejected.
J2-797	J2-797_20141201063031-20141201063409.mov	Sci Cam	2014/12/01 6:30:32	2014/12/01 6:34:08	A new iron mat covered. Getting T and maybe a sample if it doesn't all fall down.
J2-797	J2-797_20141201063918-20141201063944.mov	Sci Cam	2014/12/01 6:39:54	2014/12/01 6:39:54	wrong camera for watching sampling of BM1-C1; switched to pilot cam
J2-797	J2-797_20141201063953-20141201064354.mov	PilotCam	2014/12/01 6:39:54	2014/12/01 6:43:53	J797 BM1C-1`& C2; biomat sampling
J2-797	J2-797_20141201065203-20141201065303.mov	PilotCam	2014/12/01 6:52:00	2014/12/01 6:53:03	filling C1 & C2 more
J2-797	J2-797_20141201065402-20141201065629.mov	PilotCam	2014/12/01 6:54:00	2014/12/01 6:56:29	J797 BM1 C3; biomat sampling--but only positioning and shift change so turned off until ready
J2-797	J2-797_20141201065748-20141201065938.mov	PilotCam	2014/12/01 6:57:50	2014/12/01 6:59:38	J797 BM1 C3; biomat sampling (actually this time) & C4
J2-797	J2-797_20141201085400-20141201085555.mov	Sci Cam	2014/12/01 8:54:00	2014/12/01 8:55:54	J2797 SS (sample 44) suction sample of Saipanda Horn
J2-797	J2-797_20141201085611-20141201085800.mov	PilotCam	2014/12/01 8:56:01	2014/12/01 8:58:00	same as above. Better view from pilot cam. (J2797 SS (sample 44) suction sample of Saipanda Horn)
J2-797	J2-797_20141201090616-20141201090916.mov	PilotCam	2014/12/01 9:06:16	2014/12/01 9:09:29	RNA Later Scoop 2; just looking at scoop and where to sample
J2-797	J2-797_20141201090928-20141201091208.mov	Brow cam	2014/12/01 9:09:29	2014/12/01 9:12:09	RNA Later Scoop 2; taking sample----getting ready
J2-797	J2-797_20141201091315-20141201092213.mov	Brow cam	2014/12/01 9:13:17	2014/12/01 9:22:13	RNA Later Scoop 2; taking sample for reals
J2-797	J2-797_20141201095818-20141201103244.mov	SciCam	2014/12/01 9:58:19	2014/12/01 10:32:48	circling "Big Skinny" chimney (Shar-pen) for photo mosaic
J2-797	J2-797_20141201103818-20141201103834.mov	SciCam	2014/12/01 10:38:18	2114/12/01 10:38:35	Near Japanese marker on Balten (probably) chimney
J2-797	J2-797_20141201105058-20141201105145.mov	SciCam	2014/12/01 10:50:59	2014/12/01 10:51:45	Crab eating shrimp
J2-797	J2-797_20141201114757-20141201115027.mov	SciCam	2014/12/01 11:47:58	2014/12/01 11:50:27	sampling with BigBoyScoop at SnapSnap (sample 51)
J2-797	J2-797_20141201132112-20141201132114.mov				throwaway
J2-798	J2-798_20141204223121-20141204223620.mov	SciCam	2014/12/04 22:31:25	2014/12/04 22:36:25	Jason launch for dive J2-798 - off deck into the water
J2-798	J2-798_20141204224127-20141204224515.mov	BrowCam	2014/12/04 22:41:20	2014/12/04 22:45:20	Jason launch for dive J2-798 - going down getting dark
J2-798	J2-798_20141205002554-20141205003030.mov	SciCam	2014/12/05 0:26:00	2014/12/05 0:30:30	Mussels at Eifuku upslope of Champagne area
J2-798	J2-798_20141205004109-20141205004327.mov	SciCam	2014/12/05 0:41:20	2014/12/05 0:43:30	Mussels near Champagne
J2-798	J2-798_20141205005312-20141205005557.mov	SciCam	2014/12/05 0:53:20	2014/12/05 0:56:00	Mussels below Champagne
J2-798	J2-798_20141205005926-20141205010500.mov	SciCam	2014/12/05 0:59:40	2014/12/05 1:05:10	Mussels shrimp snails limpets below Champagne

Dive	Filename (renamed)	Camera	Begin	End	Notes
J2-798	J2-798_20141205012700-20141205012845.mov	SciCam	2014/12/05 1:27:00	2014/12/05 1:29:00	Lower end of Sulfur Slope shrimp on sulfur
J2-798	J2-798_20141205023119-20141205023220.mov	SciCam	2014/12/05 2:31:27	2014/12/05 2:32:23	Red shrimp on veil iron mat
J2-798	J2-798_20141205042252-20141205042511.mov	SciCam	2014/12/05 4:23:00	2014/12/05 4:25:14	Flow at Yellow-Cone-14 backside
J2-798	J2-798_20141205043114-20141205043125.mov	SciCam	2014/12/05 4:31:40	2014/12/05 4:32:00	Wanted to do pilot cam of rolling bacterial ball- Times are approximate
J2-798	J2-798_20141205061757-20141205061844.mov	SciCam	2014/12/05 6:17:00	2014/12/05 6:18:00	fluids around sulfur slope with shrimp and limpets
J2-798	J2-798_20141205061947-20141205062243.mov	SciCam	2014/12/05 6:19:49	2014/12/05 6:22:49	venting near sulfur slope; mussels, shrimp, sulfur, hot water and gas bubbles
J2-798	J2-798_20141205063412-20141205063510.mov	SciCam	2014/12/05 6:34:00	2014/12/05 6:35:10	venting at Champagne
J2-798	J2-798_20141205064028-20141205064310.mov	SciCam	2014/12/05 6:40:30	2014/12/05 6:43:10	marker GAR1-3 at Champagne vent; going to put marker 144 here
J2-798	J2-798_20141205070050-20141205070246.mov	SciCam	2014/12/05 7:00:51	2014/12/05 7:02:48	Cliff House venting in area where we might put marker; shrimp, mussels, limpets (two kinds) marker not placed in this video
J2-798	J2-798_20141205071459-20141205071742.mov	SciCam	2014/12/05 7:15:00	2014/12/05 7:17:42	Cliff House video is start of photo mosaic fly by after marker (#145) placement
J2-798	J2-798_20141205110253-20141205110336.mov	SupScorp	2014/12/05 11:02:54	2014/12/05 11:03:42	trying to take video highlight of deployed sediment plates, proto traps and MTRs at Champagne
J2-798	J2-798_20141205112848-20141205112952.mov	SupScorp	2014/12/05 11:28:49	2014/12/05 11:29:52	shrimp, mussels, squat lobsters, mat at MKR 144
J2-798	J2-798_20141205122136-20141205122351.mov	SciCam	2014/12/05 12:21:37	2014/12/05 12:23:53	BioMat sampling at Marker 144
J2-798	J2-798_20141205130724-20141205130907.mov	BrowCam	12/5/2014 13:07:30 PM	12/5/2014 13:09:08 PM	beauty shot elevator
J2-798	J2-798_20141205131746-20141205131749.mov		NA	NA	throwaway
J2-798	J2-798_20141205143643-20141205144213.mov	SciCam	2014/12/05 14:37:15	2014/12/05 14:42:18	J798-bM1-C1-17 attempt at sampling- no sample taken because syringe 1 and 5 firing simultaneously
J2-798	J2-798_20141205144533-20141205144731.mov	SciCam	2014/12/05 14:45:34	2014/12/05 14:37:32	J798-BM1-C1-17 sampling iron mat at 19.5 degree vent. Just first sampling before any expulsion
J2-798	J2-798_20141205145136-20141205145310.mov	SciCam	2014/12/05 14:51:38	2014/12/05 14:53:13	J798-BM1-C2-18 sampling same place as J2-798-BM1-C1-17
J2-798	J2-798_20141205152023-20141205152455.mov	SciCam	2014/12/05 15:20:27	2014/12/05 15:24:58	J798-BM1-C4-19 sampling just above where T>30
J2-798	J2-798_20141205152810-20141205152940.mov	SciCam	2014/12/05 15:28:20	2014/12/05 15:29:40	J798-BM1-C4-19 sampling just above where T>30 after water expulsion
J2-798	J2-798_20141205170422-20141205170541.mov	SciCam	2014/12/05 17:04:24	2014/12/05 17:05:43	Excavating a flat surface for slide trap 3 and MTR 4001
J2-798	J2-798_20141205173036-20141205173222.mov	SciCam	2014/12/05 17:30:40	2014/12/05 17:32:26	J798-BM1-D1 iron mat/ chimney
J2-798	J2-798_20141205173406-20141205173520.mov	SciCam	2014/12/05 17:34:07	2014/12/05 17:35:23	J798-BM1-D1 continued
J2-798	J2-798_20141205183810-20141205184854.mov	PilotCam	2014/12/05 18:38:00	2014/12/05 18:48:00	Video of later scoop with broken hand; trying to open--may want to show video to Jimmy to get a fix for the broken handle; at Yellow Cone
J2-798	J2-798_20141205201315-20141205201520.mov	SciCam	2014/12/05 20:13:00	2014/12/05 20:15:00	RNA Later scoop 34 at same place as HFS 30-32
J2-798	J2-798_20141205211827-20141205211949.mov	SciCam	2014/12/05 21:18:30	2014/12/05 21:19:00	just below Red Top, crab in a hole, T-probe
J2-798	J2-798_20141205212341-20141205212425.mov	SciCam	2014/12/05 21:23:43	2014/12/05 21:24:35	crab getting' probed

Dive	Filename (renamed)	Camera	Begin	End	Notes
J2-798	J2-798_20141205225504-20141205225750.mov	SciCam	2014/12/05 22:55:11	2014/12/05 22:57:50	Releasing elevator
J2-798	J2-798_20141205225927-20141205230209.mov	SciCam	2014/12/05 22:59:27	2014/12/05 23:02:10	Elevator up
J2-798	J2-798_20141205230439-20141205230747.mov	SciCam	2014/12/05 23:04:40	2014/12/05 23:07:49	More elevator
J2-798	J2-798_20141205231515-20141205231541.mov	SciCam	2014/12/05 23:15:00	2014/12/05 23:17:00	taking off
J2-798	J2-798_20141206010746-20141206010937.mov	PilotCam	2014/12/06 1:07:15	2014/12/06 1:10:00	Attempt to record SciCam but wrong camera was selected
J2-798	J2-798_20141206010951-20141206011136.mov	SciCam	2014/12/06 1:10:00	2014/12/06 1:11:35	Squat lobster on HFS intake hose during transit
J2-798	J2-798_20141206013730-20141206013924.mov	SciCam	2014/12/06 1:37:32	2014/12/06 1:39:25	Large white Shinkai Lepas Limpets
J2-798	J2-798_20141206021219-20141206021347.mov	SciCam	2014/12/06 2:12:21	2014/12/06 2:13:39	Panorama of marker 145 after settlement plate, protozoan trap, and MTR placement
J2-798	J2-798_20141206022548-20141206022700.mov	SciCam	2014/12/06 2:25:50	2014/12/06 2:27:02	Taking pH of mussel bed, pH=7.09, T=2.6C
J2-798	J2-798_20141206023224-20141206023305.mov	SciCam	2014/12/06 2:23:28	2014/12/06 2:33:12	Squat lobster
J2-798	J2-798_20141206023352-20141206023439.mov	PilotCam	2014/12/06 2:33:54	2014/12/06 2:34:45	Squat lobster- dirty and fuzzy
J2-798	J2-798_20141206023520-20141206023607.mov	PilotCam	2014/12/06 2:35:23	2014/12/06 2:36:12	Poking at an unknown object in lobster bed
J2-798	J2-798_20141206023903-20141206024658.mov	SciCam	2014/12/06 2:39:10	2014/12/06 2:47:00	J798-Mbag-37 scooping
J2-798	J2-798_20141206025912-20141206030253.mov	SciCam	2014/12/06 2:59:13	2014/12/06 3:02:55	J798-SS-38 sucking macrobio in mussel bed
J2-798	J2-798_20141206074542-20141206074544.mov	SciCam	2014/12/06 0:00:00	2014/12/06 0:00:00	throwaway
J2-799	J2-799_20141213121000-20141213121240.mov	SciCam	2014/12/13 12:10:00	2014/12/13 12:12:40	Jason launch at night
J2-799	J2-799_20141213133304-20141213133647.mov	PilotCam	2014/12/13 13:33:15	2014/12/13 13:37:00	Recovering MTR and PrTrp104 into starboard biobox at Mkr124
J2-799	J2-799_20141213150544-20141213151023.mov	SciCam	2014/12/13 3:05:48	2014/12/13 15:10:25	J799-BM1-C1-9 ferrozine: Sample turned pink
J2-799	J2-799_20141213151944-20141213152354.mov	SciCam	2014/12/13 15:19:50	2014/12/13 15:23:55	J799-BM1-D1-10 and BM1-D2-11
J2-799	J2-799_20141213154440-20141213154544.mov	SciCam	2014/12/13 15:44:40	2014/12/13 15:46:00	J799-BM1-C5-15 ferrozine turned pink
J2-799	J2-799_20141213154630-20141213154942.mov	SciCam	2014/12/13 15:46:30	2014/12/13 15:49:49	J799-BM1-C4-16 GeoChem water sample
J2-799	J2-799_20141213162125-20141213162411.mov	SciCam	2014/12/13 16:21:26	2014/12/13 16:24:12	J799-BM1-D56 Fe mat reddish orange in color
J2-799	J2-799_20141213162735-20141213162856.mov	SciCam	2014/12/13 16:27:00	2014/12/13 16:29:00	J799-BM1-D3 Fluffy light mat
J2-799	J2-799_20141213163312-20141213163531.mov	SciCam	2014/12/13 16:33:20	2014/12/13 16:35:39	J799-BM1-B1 attempted sample of filamentous cob web like mat: No sample collected
J2-799	J2-799_20141213163934-20141213164242.mov	SciCam	2014/12/13 16:39:00	2014/12/13 16:43:00	J799-BM1-B1 attempted sample… later expelled
J2-799	J2-799_20141213164729-20141213165014.mov	SciCam	2014/12/13 16:47:00	2014/12/13 16:50:00	J799-BM1-B156-22
J2-799	J2-799_20141213170434-20141213171053.mov	SciCam	2014/12/13 17:04:00	2014/12/13 17:10:00	Lscoop3-25 No RNA in this scoop for Sean of BM1-B156 leftovers
J2-799	J2-799_20141213181752-20141213181852.mov	Sci Cam	2014/12/13 18:17:53	2014/12/13 18:18:52	Splate4 video in situ
J2-799	J2-799_20141213182215-20141213182245.mov	Sci Cam	2014/12/13 18:22:00	2014/12/13 18:22:45	Splate4 video in situ up close
J2-799	J2-799_20141213183121-20141213183230.mov	Sci Cam	2014/12/13 18:31:30	2014/12/13 18:32:00	Rock collection with egg cases for Shawn & Jason
J2-799	J2-799_20141213184641-20141213185004.mov	Sci Cam	2014/12/13 18:46:00	2014/12/13 18:50:00	Shrimp traps full on razorback
J2-799	J2-799_20141213191419-20141213192009.mov	SciCam	2014/12/13 19:14:00	2014/12/13 19:20:00	Splate 3 sampling at Champagne
J2-799	J2-799_20141213193327-20141213193607.mov	SciCam	2014/12/13 19:33:00	2014/12/13 19:36:00	mussel pH sampling at Champagne
J2-799	J2-799_20141213193652-20141213194102.mov	SciCam	2014/12/13 19:36:00	2014/12/13 19:41:00	melted mussels and sampling after pH measurements
J2-799	J2-799_20141213194435-20141213194812.mov	PilotCam	2014/12/13 19:44:00	2014/12/13 19:48:00	mussel pH sampling at second place at Champagne

Dive	Filename (renamed)	Camera	Begin	End	Notes
J2-799	J2-799_20141213195321-20141213195734.mov	SciCam	2014/12/13 19:53:20	2014/12/13 19:57:00	mussel sampling at Golden Lips, Champagne, pH 5.78
J2-799	J2-799_20141213202617-20141213202618.mov	SciCam			throwaway
J2-799	J2-799_20141213212456-20141213212824.mov	SciCam	2014/12/13 21:25:10	2014/12/13 21:28:30	Fish swimming around Jason
J2-799	J2-799_20141213213410-20141213213544.mov	SciCam	2014/12/13 21:34:00	2014/12/13 21:35:40	Jason recovery
J2-800	J2-800_20141216204233-20141216204550.mov	BrowCam	2014/12/18 20:42:30	2014/12/18 20:46:00	Jason launch
J2-800	J2-800_20141216212827-20141216213602.mov	SciCam	2014/12/18 21:28:00	2014/12/18 21:36:00	bacterial growth and mucopolysac. bags on rock near Phantom vent; scan of crude pillow like structures; shinkailepas on rocks; large patch of shrimp
J2-800	J2-800_20141216213714-20141216214439.mov	SciCam	2014/12/18 21:37:00	2014/12/18 21:44:00	pH sensor in venting area covered with O. loihi and surrounded by Alvinocaris; pH-6.2, 9C, O2-1.0
J2-800	J2-800_20141216215859-20141216220032.mov	SciCam	2014/12/18 21:59:02	2014/12/18 22:00:30	Shrimp at Phantom
J2-800	J2-800_20141216220618-20141216220941.mov	SciCam	2014/12/18 22:06:03	2014/12/18 22:09:41	Shrimp medium shot, looking for goof fluid site sample
J2-800	J2-800_20141216221017-20141216221058.mov	SciCam	2014/12/18 22:01:01	2014/12/18 22:11:06	Shrimp in rock
J2-800	J2-800_20141216221310-20141216221628.mov	SciCam	2014/12/18 22:13:11	2014/12/18 22:16:31	Shrimp on sulfur deposits
J2-800	J2-800_20141216221904-20141216222410.mov	SciCam	2014/12/16 22:05:19	2014/12/16 22:04:10	Shrimp on sulfur wall
J2-800	J2-800_20141216222457-20141216222935.mov	SciCam	2014/12/16 22:25:00	2014/12/16 22:29:40	more shrimp
J2-800	J2-800_20141216223304-20141216223732.mov	SciCam	2014/12/16 22:23:05	2014/12/16 22:37:32	Manipulating suction sampler, suction sampler shrimp
J2-800	J2-800_20141216224247-20141216224507.mov	SciCam	2014/12/16 22:42:00	2014/12/16 22:45:07	Major Sampler - red
J2-800	J2-800_20141216232527-20141216232856.mov	SciCam	2014/12/16 23:25:28	2014/12/16 23:26:28	Taking fluid sample, limpet egg cases and shrimp
J2-800	J2-800_20141216234506-20141216234811.mov	SciCam	2014/12/16 23:45:30	2014/12/17 23:48:18	Close-up of barnacles while Sterivex sampling at SmokingStones.
J2-800	J2-800_20141216235947-20141216000536.mov	SciCam	2014/12/16 23:59:50	2014/12/17 0:05:38	Limpets on the climb up sulfur wall.
J2-800	J2-800_20141217001641-20141217001855.mov	SciCam	2014/12/17 0:16:59	2014/12/17 0:18:59	Hairy bacteria on top of sulfur wall near Iceberg.
J2-800	J2-800_20141217003814-20141217003933.mov	SciCam	2014/12/17 0:38:21	2014/12/17 0:39:40	Crab at sampling site Menagerie (10mNW of Iceberg target.)
J2-800	J2-800_20141217004324-20141217010204.mov	SciCam	2014/12/17 0:43:30	2014/12/17 1:02:09	At sampling site Menagerie (10m NW of Iceberg target.)
J2-800	J2-800_20141217010314-20141217010753.mov	SciCam	2014/12/17 1:03:19	2014/12/17 1:07:55	Crab at Menagerie.
J2-800	J2-800_20141217013438-20141217013807.mov	SciCam	2014/12/17 1:34:45	2014/12/17 1:38:05	Orange Lscoop #2 at Tip Ice. Did not take scoop.
J2-800	J2-800_20141217014015-20141217014501.mov	SciCam	2014/12/17 1:40:20	2014/12/17 1:38:05	Orange Lscoop #2 at Tip Ice. Second try.
J2-800	J2-800_20141217021728-20141217021940.mov	SciCam	2014/12/17 2:17:50	2014/12/17 1:38:05	Jelly critter on mid-water transit to Barnacles. (Ctenophore?)
J2-800	J2-800_20141217023643-20141217025018.mov	SciCam	2014/12/17 2:37:00	2014/12/17 2:50:00	Marker here at Barnacles. Mkr 119.
J2-800	J2-800_20141217031354-20141217031822.mov	SciCam	2014/12/17 3:13:00	2014/12/17 3:18:00	Area of Fault Shrimp. Crab and limpets. Flow. "Crab Cavern"
J2-800	J2-800_20141217032816-20141217033416.mov	SciCam	2014/12/17 3:28:00	2014/12/17 3:34:00	Crab Cavern at Fault Shrimp. Barnacle; limpet; crab; snail.
J2-800	J2-800_20141217035320-20141217035928.mov	SciCam	2014/12/17 3:53:00	2014/12/17 3:59:00	Olde Iron Slides - 14.
J2-800	J2-800_20141217042029-20141217042439.mov	SciCam	2014/12/17 4:29:00	2014/12/17 4:25:00	Gray scoop - in iron mats.

Dive	Filename (renamed)	Camera	Begin	End	Notes
J2-800	J2-800_20141217054158-20141217054201.mov				throwaway
J2-801	J2-801_20141217182858-20141217183423.mov	PilotCam	2014/12/17 18:28:00	2014/12/17 18:34:00	Cassette C BM sampler-syringe 1 & 2 at Eleking (edit==Golden Horn, not Eleking)
J2-801	J2-801_20141217185337-20141217185725.mov	Sci Cam	2014/12/17 18:53:00	2014/12/17 18:57:00	HFS fluid sampler at same place cassettes were taken
J2-801	J2-801_20141217193651-20141217194445.mov	Sci Cam	2014/12/17 19:36:00	2014/12/17 19:44:00	Overview of Eleking (Golden Horn) chimney that we are sampling; moving from base (where previous samples were) up to a new spot
J2-801	J2-801_20141217205532-20141217210145.mov	SciCam	2014/12/17 20:55:00	2014/12/17 21:01:00	Heading up to top to look for a new spot to sample. High T at top = 8.64; pushed in a little High T =28.06
J2-801	J2-801_20141217211238-20141217211408.mov	Sci Cam	2014/12/17 21:12:00	2014/12/17 21:14:00	BM1-C414 top of Eleking (ferrozine) (Golden Horn, not Eleking)
J2-801	J2-801_20141217222336-20141217222507.mov	Sci Cam	2014/12/17 22:23:30	2014/12/17 22:25:10	Golden Horn chimney and Jason temperature probe
J2-801	J2-801_20141217222630-20141217222730.mov	PilotCam	2014/12/17 22:26:00	2014/12/17 22:27:30	Golden Horn chimney and Jason temperature probe
J2-801	J2-801_20141217223224-20141217223233.mov	Sci Cam	2014/12/17 22:32:20	2014/12/17 22:32:30	Scoop sample set up at Golden Horn chimney
J2-801	J2-801_20141217223309-20141217223709.mov	PilotCam	2014/12/17 22:33:00	2014/12/17 22:37:10	Scoop sample at Golden Horn chimney
J2-801	J2-801_20141217224149-20141217224230.mov	Sci Cam	2014/12/17 22:42:00	2014/12/17 22:42:30	Twisting scoop to mix RNA later in scoop
J2-801	J2-801_20141217225454-20141217225910.mov	PilotCam	2014/12/17 22:54:55	2014/12/17 22:59:10	Backing away from Golden Horn Chimney
J2-801	J2-801_20141218013311-20141218013640.mov	PilotCam	2014/12/18 1:33:10	2014/12/18 1:36:40	Putting scoops in elevator
J2-801	J2-801_20141218030515-20141218031306.mov	Brow cam	2014/12/18 3:05:00	2014/12/18 3:13:00	J801-BM1-D6 D5 D1 D2 D4 samples 21,22,23,24, 25 respectively
J2-801	J2-801_20141218031617-20141218031830.mov	Brow cam	2014/12/18 3:16:00	2014/12/18 3:18:00	J801-BM1-D3-26 attempt at sampling, check valve clogged
J2-801	J2-801_20141218032537-20141218033428.mov	SciCam	2014/12/18 3:25:00	2014/12/18 3:34:00	J801-SS-27 top of Golden Horn sucked
J2-801	J2-801_20141218035130-20141218035606.mov	SciCam	2014/12/18 3:51:00	2014/12/18 3:56:00	J801-Lscoop4-28
J2-801	J2-801_20141218040934-20141218041409.mov	Sci Cam	2014/12/18 4:09:00	2014/12/18 14:14:00	J801-BM1-X6-29 also X1 and X2 samples 30 and 31
J2-801	J2-801_20141218042041-20141218042344.mov	Sci Cam	2014/12/18 4:20:00	2014/12/18 4:23:00	J801-BBscoop sample for in-tact mat
J2-801	J2-801_20141218045640-20141218045816.mov	SciCam	2014/12/18 4:56:00	2014/12/18 4:58:16	J801-BM1-X5 X4
J2-801	J2-801_20141218045905-20141218050039.mov	SciCam	2014/12/18 4:59:00	2014/12/18 5:00:00	J801-BM1-X3
J2-801	J2-801_20141218061500-20141218062525.mov	Sci Cam	2014/12/18 6:15:00	2014/12/18 6:25:00	J801-SPME-44
J2-801	J2-801_20141218062923-20141218063125.mov	Sci Cam	2014/12/18 6:29:00	2014/12/18 6:31:00	Highlight of Splate 5
J2-801	J2-801_20141218063234-20141218063824.mov	Sci Cam	2014/12/18 6:32:00	2014/12/18 6:38:00	Highlight of putting out marker and taking chimney
J2-801	J2-801_20141218064420-20141218064616.mov	Sci Cam	2014/12/18 6:44:00	2014/12/18 6:46:00	highlight of SPME-46 background sample on the ascent
J2-801	J2-801_20141218090307-20141218090310.mov				throwaway

5-3 Dive Summaries

J2-797

Main goals: Recon, BioMat, scoop & fluid sampling, recover 2010 settling plates.
Sample totals: 24 biology; 20 fluid; 3 gas; 1 geology

JASON preparing for the first dive.

Snail Site: Dive began with search for Marker-112 site to do reconnaissance but marker not found. Found 2010 Beaulieu settlement plate #5 with small marker #20 and recovered it. Found Marker-108 and took temperature readings. Headed for Marker-114 (marker not found) but took 4 HFS samples in the area. Returned to Marker-108 site. , took 12 BioMat samples and 3 HFS samples. Conducted photomosaic survey centered on Marker-24, 25-meter box. Deployed 2 Beaulieu settlement plates on either side of crack from where 2010 Beaulieu's plate was recovered at Marker-20 (found). Deployed Arellano's settlement plate at the same site. Went to Marker-24 site, saw venting at 140-182degC with high flow, sulfur mats and shrimp. Took 4 HFS, 2 gas and one rock sample at this site. Transferred samples to elevator then transited to Urashima site, 3.5 hours.
Urashima Site: Began survey in older chimneys, shallower than the target depth site. Moved to Marker-109 target site, encountering first active chimneys. Set navigator targets at site, (had old marker on it but couldn't read any identification, later identified as Baltan), target originally named Active on this dive) and Snap-Snap. Conducted photomosaic survey, 50x50m, with Baltan chimney at center of box. Returned to Snap-Snap and measured temperatures of 26.23degC at vent, in veil-like mat. Moved to Baltan chimney and measured temperature over 150degC. Took 3 HFS, 1 gas and one BioMat sample. Moved to other side of Baltan and then went to skinny spire nearby, named it Saipanda horn. Took 4 BioMat cassette samples, 6 HFS, 1 suction and 1 scoop sample at various heights on the chimney. After surveying a number of chimney structures, returned to Snap-Snap. Took 3 BioMat cassette samples, 1 L-scoop and 1 big-boy scoop samples. Took one last sample of a sulfide near Shar-Pen before the end of the dive.

J2-798

Main goals: Recon, BioMat, scoop & fluid sampling, deploy settling traps, proto traps & slide traps.
Sample totals: 20 biology; 18 fluid; 2 gas

NW Eifuku: Began dive on bottom SE of elevator drop position and dive targets. Conducted Reson test on way to the elevator. Did a site survey of the area in clockwise direction from elevator out toward TopTower, BactoBalls site and ending at Yellow-Cone, looking for best sampling sites. Did photomosaic line from TopTower to NW and near RustySpire. Found mat and few bacteria balls near old BactoBalls and named site Not-Dead-Yet. At Yellow-Cone did a survey of the mat extent, setting a target nearby called RedTop. Went on search for Champagne Site and found some bubbles at the Champagne-2006 site. Searched for an old Japanese dive marker and found an instrument, GARI-3 instead. Deployed Mkr-144 at this site with large aggregations of mussels. Went in search of CliffHouse and found a new venting site, Razorback, where Mkr-145 was deployed. Did short photomosaic line at Razorback. Returned to Champagne (Mkr-144) and conducted photomosaic in a grid pattern. Took 8 HFS, 2 gas, 6 BioMat cassette samples around Mkr-144 at 2 locations. Deployed SPlate 2 & 3 with 2 MTRs, PRTrap 4. Returned to elevator and swapped out instruments. Headed to Yellow-Cone. Deployed ShrimpTrap2 and then took 4 BioMat cassette samples, 3 HFS samples. Deployed ShrimpTrap1, SlideTraps 1-3 with a MTR and Mkr-146. Moved north to active-looking mat and took 5 BioMat, 3 HFS samples. Returned to elevator to swap out samplers. Headed back to Yellow-Cone. Took 2 majors and one LScoop sample. Deployed Mkr-124 at site near LScoop sample. Returned to ShrimpTrap1 near Mkr-146 and took LScoop sample. Returned to elevator and sent it to surface. Restarted dive-ops at Mkr-145 (Razorback). Deployed SPlate4 with MTR, PrTrop113 with MTR at Mkr-145. Collected mussel scoop sample upslope from Mkr-145. Also took suction sample of mussels. Deployed ShrimpTrap 3 & 4 at mussel bed area. Placed markers 123 & 140 next to traps for next dive (never recovered). Conducted Reson multibeam survey starting at NW extent. Finished 3 of 8 survey lines before dive ended due to weather. Attempted to take plankton net sample during Reson survey (unsuccessful due to recovery problem).

J2-799
Main goals: Recover experiments on bottom, BioMat & fluid sampling. Scoop sampling, mussel bag sampling.
Sample totals: 29 biology; 8 fluid; 2 gas; 1 bio-geo

NW Eifuku: Began dive on bottom heading to Mkr-124 at Lower Yellow-Cone. Recovered Protist Trap and MTR. Nearby, collected LScoop sample, 2 HFS in iron-oxide sediments. At Mkr-146 recovered 3 SlideTraps, 2 MTRs and one Shrimp Trap. Took 24 BioMat samples, 2 HFS, 2 LScoop samples. Headed to Mkr-145/Razorback site. Recovered SPlate, MTR and Protist Trap. Took a rock sample and 2 HFS samples. Next recovered 2 Shrimp Traps up on the ridge with the marker. Next went to Mkr-144/Champagne site, taking Sterivex HFS sample while wand was in holster. Recovered one SPlate, 2 MTRs and Protist Trap. Left one SPlate on seafloor with no space available on basket. Collected mussel sample with scoop net, just NW in dense accumulation (GoldenLips). Took second mussel sample in densely populated area with 2 HFS samples and 1 GTHFS sample in the holster.

J2-800
Main goals: Recon eruptive and hydrothermal vents, BioMat and fluid sampling. Suction sample of shrimp, collect barnacles & limpets.
Sample totals: 11 biology; 17 fluid; 4 gas; 6 bio-geo

NW Rota-1: Began dive at Phantom Vent (no marker remaining). Took HFS and rock with limpets sample in diffuse venting. Moved east through Sulfur and Brimstone vents, no markers found, took one HFS near Brimstone. Just north of Brimstone encountered large quantities of shrimp in the area of the 2010 Arrowhead target. Took 3 HFS, 1 GTHFS, shrimp suction and major sample at this site. Next went east passing through Styx and then SE to Charon without seeing venting. Started background Sterivex sample. Moved deeper down on Cliff and encountered some smoke in water, shrimp and limpets with egg cases. Took 3 HFS, 1 GTHFS and a rock with limpets/egg cases at site, named site Smoking Stones. Climbed sulfur wall with limpets, heading north to Mkr-117/Limpet Lair. No marker found. Continued up wall into area with lots of biology and venting, named site Menagerie. Took 3 HFS, 1 GTB sample. Headed to Iceberg target but no marker found. In area of white bacterial mat took LScoop, 3 BioMat samples, named site TipIce. Headed east toward Barnacles, found Mkr-119. Took 4 rock samples with filamentous bacteria on them. Moved to Mkr-112/Fault Shrimp site (marker still there) and then nearby Mkr-113/SulfurSlide. At FaultShrimp took 3 HFS, 1 major and 1 GTB samples in CrabCavern. Moved over to knife-edge ridge with distinct yellow sediment, named target OldeIronSlides. Took 5 BioMat and one scoop sample of the sediment.

J2-801
Main Goals: BioMat and fluid sampling, suction sample of iron mat, deploy and recover settling traps.
Sample totals: 29 biology; 16 fluid; 2 gas; 1 geology

Urashima: Began dive west of GoldenHorn, at the Old Dead Chimneys target. Took 5 BioMat and 3 HFS samples at base of GoldenHorn. Moved up chimney 2 meters, took 3 BioMat and 2 HFS samples. Moved up chimney 5 meters, took 2 BioMat and 3 HFS samples. Returned to base of GoldenHorn to take LScoop and regular Scoop from 2 locations at base. Waited for elevator to be deployed to retrieve samples. Swapped out samplers at elevator, about 160m south of GoldenHorn. Returned to GoldenHorn. Took 6 BioMat samples, 1 suction of mat and LScoop near top of chimney. Back down to base of chimney and took 3 BioMat and 1 BigBoy Scoop samples. Up a few meters of the chimney took a major sample and 3 BioMat samples. At top of chimney took HFS Sterivex sample. Moved over to sample hot water chimney (Ultra-no-chichi). Took 2 HFS , 2 GTHFS samples. In slightly different position up the chimney took HFS sample and SPME sampler. On top of chimney deployed SPlate and Mkr-125. Took a sample of a chimney piece. Observed Japanese Marker on higher part of chimney (Mkr-125 is on the lower part). On ascent took 2 HFS and 1 SPME background samples.

5.4 Instrument Deploy/Recover

NW EIFUKU Deploy - Recover

Instrument Item	DEPLOY								RECOVER		
	Latitude N	Longitude E	Location	Jason Depth	Heading	Time	Dive Deployed	VV	Dive Recovered	Time	Sample Number
Mkr 144	21 29.2435	144 2.4906	Champagne 2014 Site	1607	41	12/5/2014 6:46	J798	4040			
Mkr145	21 29.2498	144 2.5039	Razorback (NE Champagne)	1566	73	12/5/2014 7:10	J798	4093			
MTR-3048	21 29.2442	144 2.4851	Mkr144 Champagne Site	1608	61	12/5/2014 10:43	J798	4529	J799	19:21	
SPlate #2	21 29.2442	144 2.4851	Mkr144 Champagne Site	1608	61	12/5/2014 10:48	J798	4536		not recovered	
SPlate #3	21 29.2442	144 2.4851	Mkr144 Champagne Site	1608	61	12/5/2014 10:51	J798	4541		19:16	J799-Splate3-34
PrTrp #4 MTR3291	21 29.2442	144 2.4851	Mkr144 Champagne Site	1607	57	12/5/2014 10:57	J798	4554	J799	19:23	J799-PrTrap-35
ShrimpTrap2	21 29.2654	144 2.51728	Mkr146 Yellow Cone area	1579	245	12/5/2014 14:30	J798	4916		not recovered	
ShrimpTrap1	21 29.2669	144 2.5182	Mkr146 Yellow Cone area	1577	272	12/5/2014 16:47	J798	5158	J799	14:43	J799-ShrTrap1-05
SlideTrap1	21 29.2669	144 2.5182	Mkr146 Yellow Cone area	1577	272	12/5/2014 16:50	J798	5167	J799	14:48	J799-SlideTrap1-06
SlideTrap2	21 29.26697	144 2.5182	Mkr146 Yellow Cone area	1577	272	12/5/2014 16:57	J798	5175	J799	14:49	J799-SlideTrap2-07

NW EIFUKU Deploy - Recover

Instrument Item	DEPLOY								RECOVER		
	Latitude N	Longitude E	Location	Jason Depth	Heading	Time	Dive Deployed	VV	Dive Recovered	Time	Sample Number
MTR4001	21 29.26697	144 2.5182	Mkr146 Yellow Cone area	1577	258	12/5/2014 17:07	J798	5191	J799	14:50	
SlideTrap3	21 29.26697	144 2.5182	Mkr146 Yellow Cone area	1577	258	12/5/2014 17:08	J798	5194	J799	14:50	J799-SlideTrap3-08
Mrkr146	21 29.2676	144 2.5172	Upper Yellow Cone area	1577	258	12/5/2014 17:11	J798	5198			
Mkr124	21 29.2738	144 2.5188	Lower Yellow Cone area	1584	296	12/5/2014 21:07	J798	5585			
MTR4094	21 29.2738	144 2.5188	Mkr-124 Yellow Cone	1585	214	12/5/2014 22:11	J798	5708	J799	13:35	
PrTrp 104	21 29.2738	144 2.5188	Mkr-124 Yellow cone	1585	214	12/5/2014 22:13	J798	5710	J799	13:33	J799-PrTrap-01
SPlate4	21 29.2498	144 2.5039	Mkr-145	1566	144	12/6/2014 1:52	J798	6006	J799	18:20	J799-Splate4-26
MTR3173	21 29.2498	144 2.5039	Mkr-145	1566	144	12/6/2014 1:56	J798	6013	J799	18:29	
PrTrp 113	21 29.2498	144 2.5039	Mkr-145	1566	144	12/6/2014 2:09	J798	6032	J799	18:29	J799-PrTrap113-27
ShrimpTrap3	21 29.2504	144 2.5079	Mkr-145	1562	167	12/6/2014 3:11	J798	6158	J799	18:51	J799-ShrTrap3-32
ShrimpTrap4	21 29.2504	144 2.5079	Mkr-145	1562	167	12/6/2014 3:11	J798	6158	J799	18:49	J799-ShrTrp4-31

NW EIFUKU Deploy - Recover

Instrument Item	DEPLOY								RECOVER		
	Latitude N	Longitude E	Location	Jason Depth	Heading	Time	Dive Deployed	VV	Dive Recovered	Time	Sample Number
(Mkrs 123 and 140)	21 29.2504	144 2.5079	Mkr-145	1561	134	12/6/2014 3:19	J798	6171	j799	not recovered	

Snail/Urashima Deploy - Recover

SPlate5 (2010)	12 47.188	143 37.155	Marker-20 Stace 5 (2010)	2848	288	11/30/2014 7:55	J797	414	J797	7:55	J797-SPlate5-01
SPlate1sma	12 57.1926	143 37.1632	Marker-20 Stace 5 nav target	2845	188	11/30/2014 15:19	J797	1143		not recovered	
SPlate1	12 57.1903	143 37.1636	Marker-20 Stace 5 nav target	2844	263	11/30/2014 14:56	J797	1094		not recovered	
Splate2	12 57.1903	143 37.1636	Marker-20 Stace 5 nav target	2844	263	11/30/2014 15:03	J797	1108		not recovered	
Mkr-125	12 55.3378	143 38.9506	Ultra-no-chichi	2929	123	12/18/2014 6:30	J801	15088			
Splate-5	12 55.3378	143 38.9506	Ultra-no-chichi	2929	123	12/18/2014 6:30	J801	15085		not recovered	

5.5 Dive Maps and Navigation

Navigation

Navigation during the Jason dives utilizing the USBL was relatively good on all dives. During sampling, with a stationary vehicle, navigation locations from Jason drift so positions for samples and significant targets are logged from a navigation cursor position taken during the dive from the Navigator logging screen when the data logger verifies the position as good with the Jason navigator. On the dive maps, positions for samples and targets may not actually correspond directly with the post-processed vehicle navigation track for this reason. These errors in position occur from dive to dive as well as from cruise to cruise, generally on the order of 10s of meters. Markers are essential for actual place identification however working in a dynamic environment, such as hydrothermal venting systems and active volcanoes, marker retention is difficult between years. Note that the Jason altimeter was not logging data on any of these dives.

Navigation processing as taken from Jason Navigation Documentation:
Primary Jason navigation was derived from a Doppler Velocity Log (DVL) system in combination with heading from a high performance inertial navigation system (INS). DVL velocities were integrated to estimate dead reckoned position. Georeferenced information from the ultra-short baseline (USBL) was also collected and was used to augment the dead reckoned history. After a dive the Jason data processor performed a post---processing task we call "renavigation". Renavigation was performed using software developed in a cooperative effort between the Dynamical Systems and Control Laboratory (DSCL) at Johns Hopkins University and NDSF. In this task the raw DVLNav logs, which contained all records produced by navigation sensors at their native rate, were used to recreate the navigation history. The DVL velocity history was reintegrated using a more accurate sound speed. This history was mathematically merged with a cleaned history from USBL to yield an improved result. The result was written in a variety of formats, suitable for use in a variety of post---processing applications. The data processor had two algorithms available to him/her for the merge of dead reckoning with USBL, each with particular strengths. The Least Squares Fit (LSQ) technique maintains the dead reckoned history, shifting its mean position to the mean position of the USBL history. The complementary filter (CF) technique uses a more equal balance of USBL history and the dead reckoned history. Results from the CF technique are generally preferred and are usually delivered; however, poor quality USBL input to the merge, perhaps from noisy or null raw USBL measurements, can make the CF result inferior to the LSQ result. Therefore, for select dives or portions of dives the data processor may have provided additional or alternative renavigation products for your benefit. In some cases, if USBL was not used or if the quality of the USBL positions was poor, the DVL positions may have been manually edited. In this case, the original DVL positions were left largely unchanged except for the removal of positions that are obviously incorrect. Files created through manual editing are labeled as "edited" rather than "renav."

Dive-specific navigation (Scott McCue/Jason and Andra Bobbitt):

• J2--797 was renavigated from start to finish using the CF technique. This method preserved the larger scale georeferenced detail of the lowering, but fine detail is lost due to noise in the USBL information. Additional renavigation was performed while working at two vent sites (Snail and Urashima) using the LSQ technique and this is the navigation used for the dive logs and maps in this report. At the Snail Site, previous markers that were visited were Mkr-108, Mkr-22, Mkr-20, Mkr-24 and one unidentified marker east of Mkr-22. Marker 114a was not found during this dive. All deployed instruments were left on the seafloor. At the Urashima Site, the only marker seen was on Baltan but the number wasn't readable, assumed to be Mkr-109.

• J2--798 navigation post-processing was split into two timeframes: during the multibeam survey and otherwise. Both were renavigated using the CF technique. The only previous marker at this site was deployed by the Japanese and was not identified on this dive. An older instrument with the label, GARI-3, was discovered when looking for the old marker however we have no information about who or when this was deployed. On this dive, Mkr-144 was deployed in the Champagne venting area and Mkr-145 was deployed at a new site, Razorback. At the major Yellow Cone sampling areas, Mkr-146 was placed at Upper Yellow Cone and Mkr-124 at Lower Yellow Cone. Two other markers (123 & 140) were also placed on the seafloor, intended for use later in the dive series, however they were never intentionally deployed and their lines not fully extended. They are located just east, less than 10 meters of Mkr-145. The multibeam navigation may be further reprocessed with the bathymetry data at a later date.

• J2--799 renavigated as single history using the CF technique. No additional markers deployed. Instruments SPlate-2 and ShrimpTrap-2 were left on the seafloor with the undeployed markers 123/140.

•J2--800 was renavigated as single history using the CF technique. Markers missing/not seen were Mkr-120 (Sulfur Vent), Mkr-161 (Brimstone), Mkr-164 (Sulfur Wall), Mkr-117 (N-Limpet Lair), and Mkr-110 (Iceberg09). Old markers found were Mkr-119 (Barnacles), Mkr-112 (E-FaultShrimp09) and Mkr-113 (Sulfur Slide). Mkr-163 at the summit in 2009 was not visited, it may or may not still be on the seafloor.

• J2--801 post-processing was split into four timeframes. This was forced by switching between DVL units during the lowering by the Jason navigator, who sought to improve bottom tracking. All were renavigated using the CF technique. Mkr-125 was deployed with the SPlate-5 instrument left on the seafloor, at Ultra-no-chichi.

Dive Maps

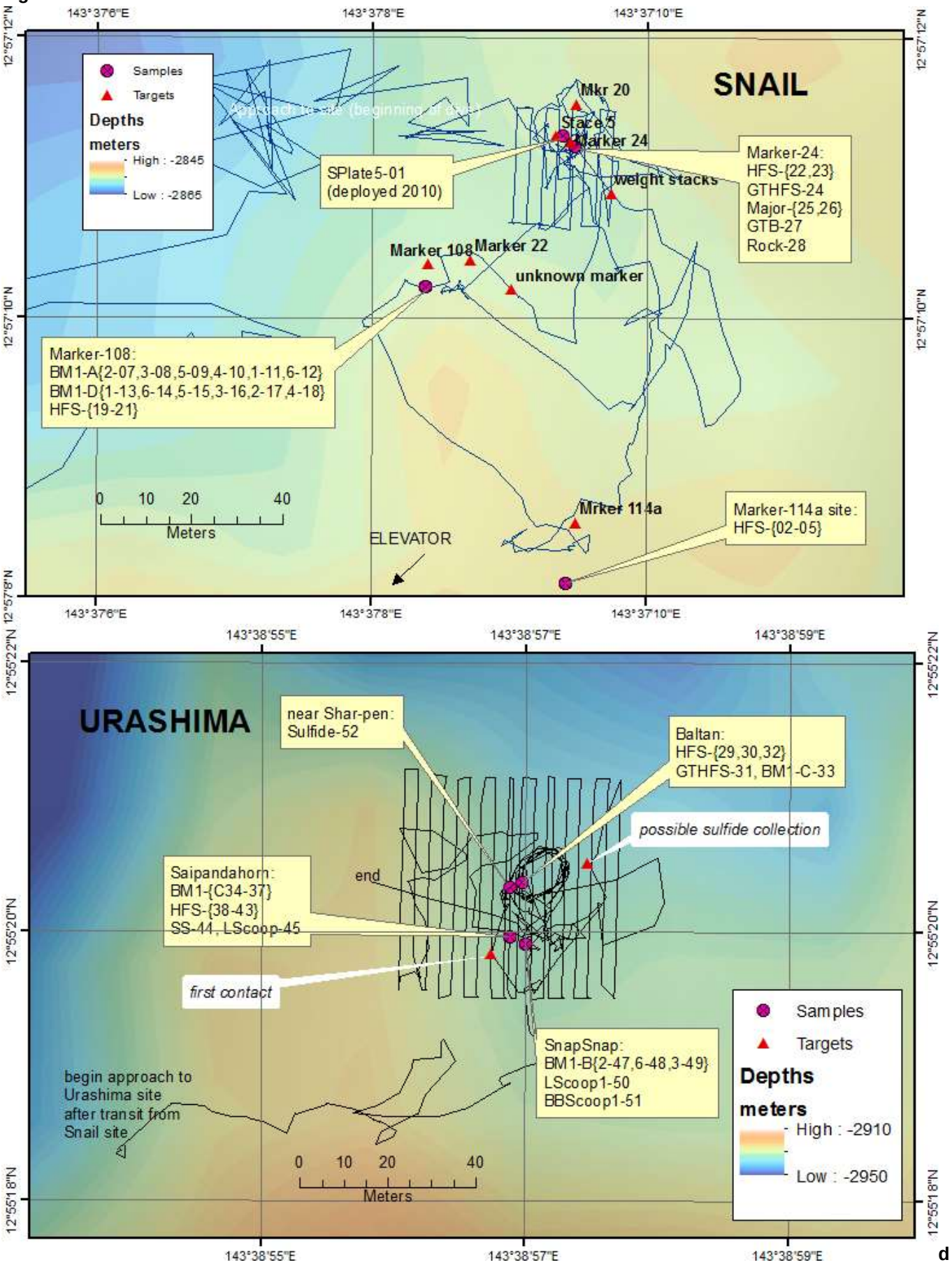
Dive maps were created utilizing GIS and ArcMap software. Maps in the report are not projected, data is displayed in geographic coordinates (equal spacing for latitude and longitude). Scale bars are in meters, however, for more accurate measurements in meters, a more appropriate projection should be used. Bathymetry data source varied for each dive location:

J2-797 and J2-801 (Fig. 5.2-1, 5.2-2 and 5.2-6) were made using EM300 data collected in 2003/2004 and gridded at 35-meters.

J2-798 (Fig. 5.2-3) and J2-799 (Fig. 5.2-4) used Imagenex bathymetry, gridded at 2-meters, collected by ROPOS in 2004 and then the grid was shifted by 16-meters in X and -11-meters in Y from its original space. This shift was done at sea after J2-798 to best fit features from the Reson multibeam collected on J2-798. J2-799's map also displays the Reson multibeam collected on J2-798 and initially processed at sea by Scott McCue, gridded at 1-meters.

J2-800 (Fig. 5.2-5) is SM2000 multibeam data collected in 2010 by Jason and gridded at 2-meters.

Fig. 5.5-1 J2-797 Snail and Urashima



d

Fig. 5.5-2 J2-797 Overview

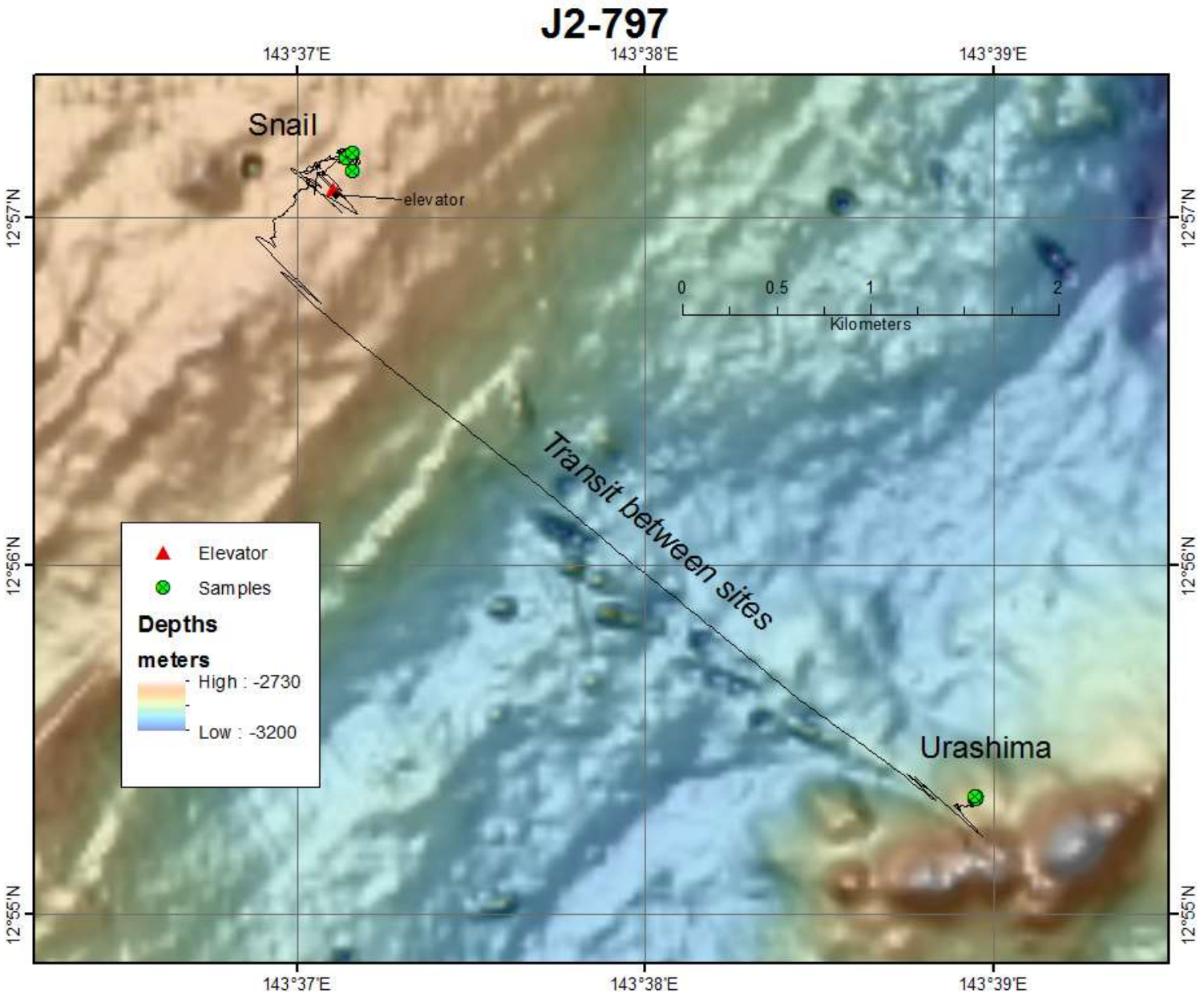


Fig 5.5-3 J2-798 NW Eifuku

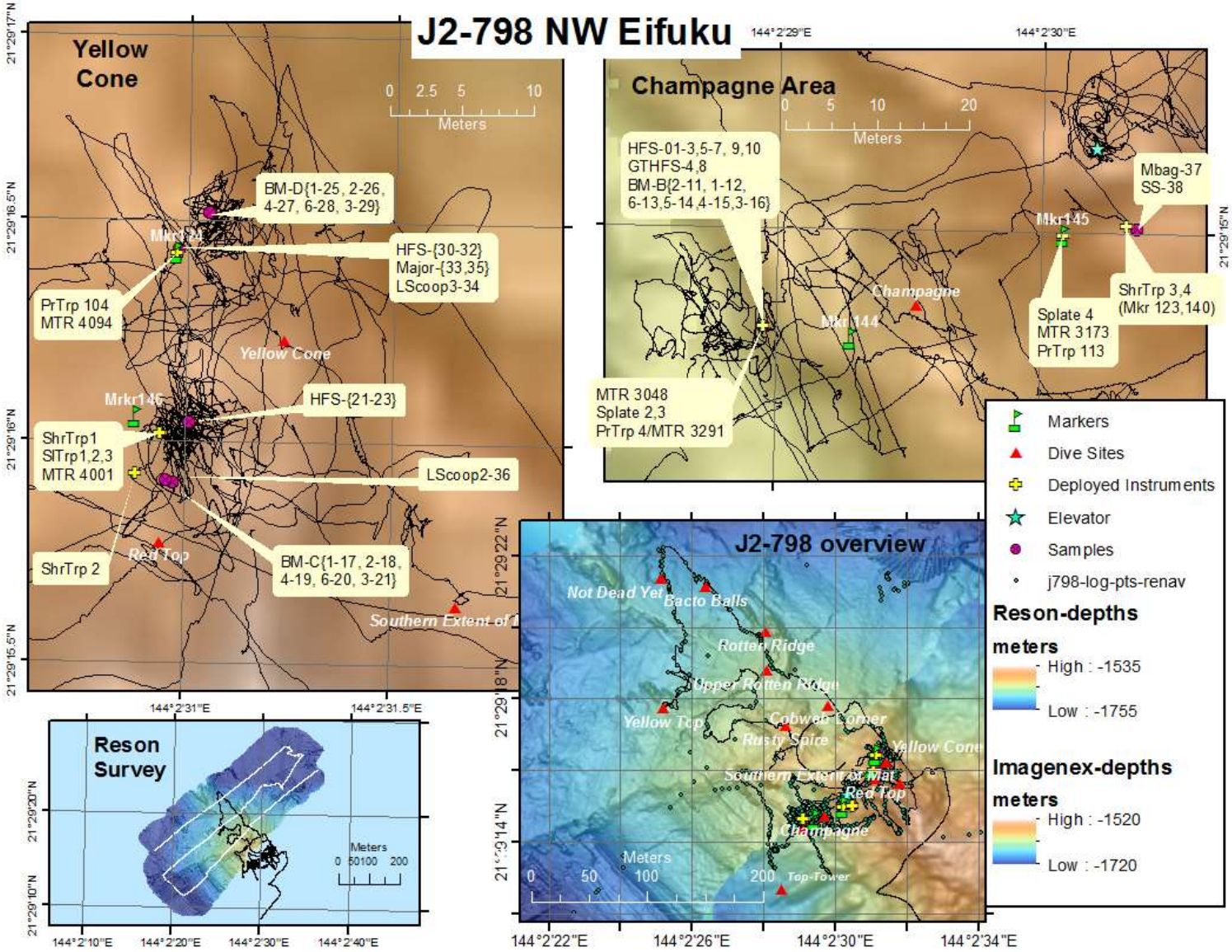


Fig 5.5-4 J2-799 NW Eifuku

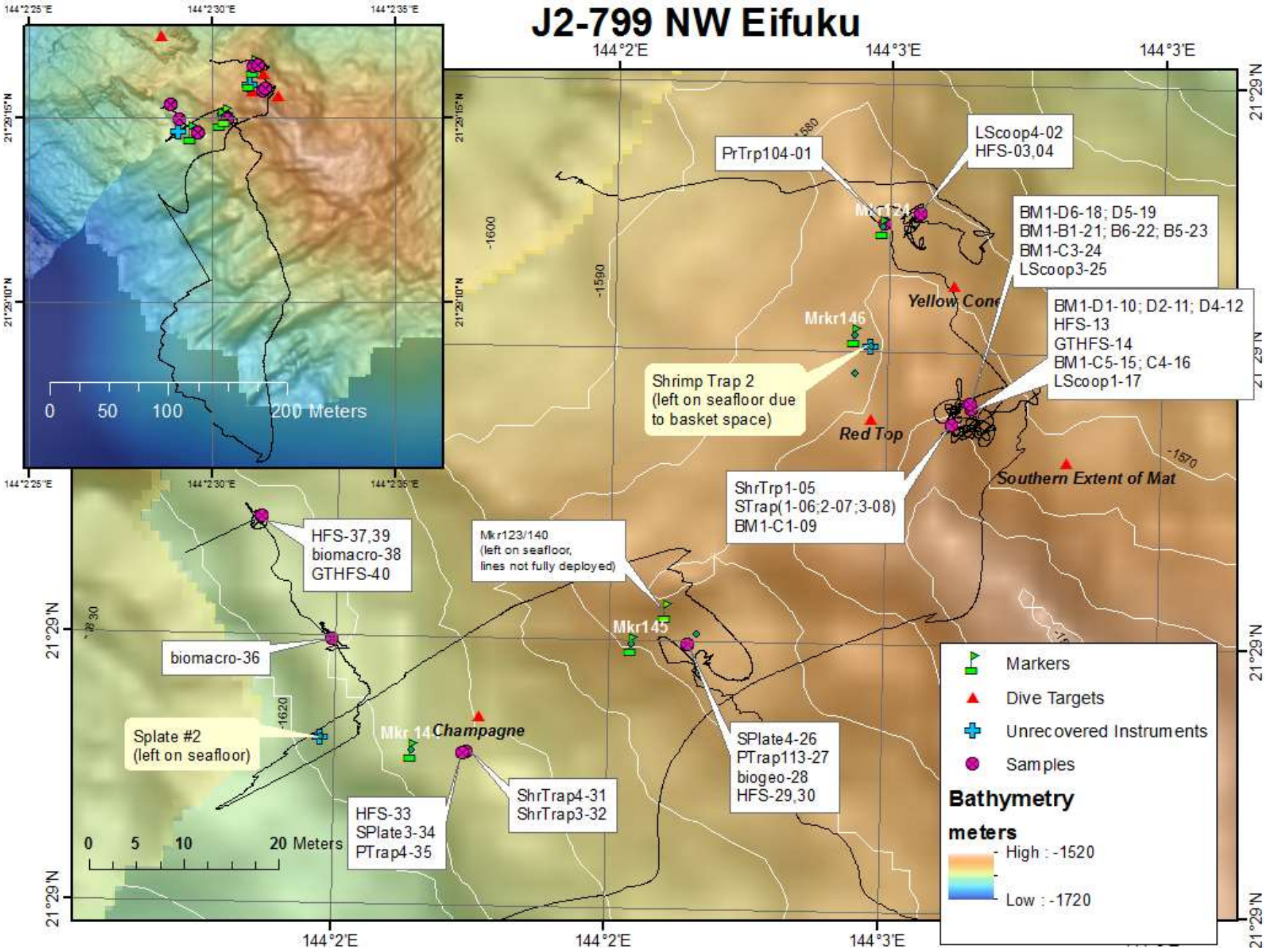


Fig 5.5-5 J2-800 NW Rota-1

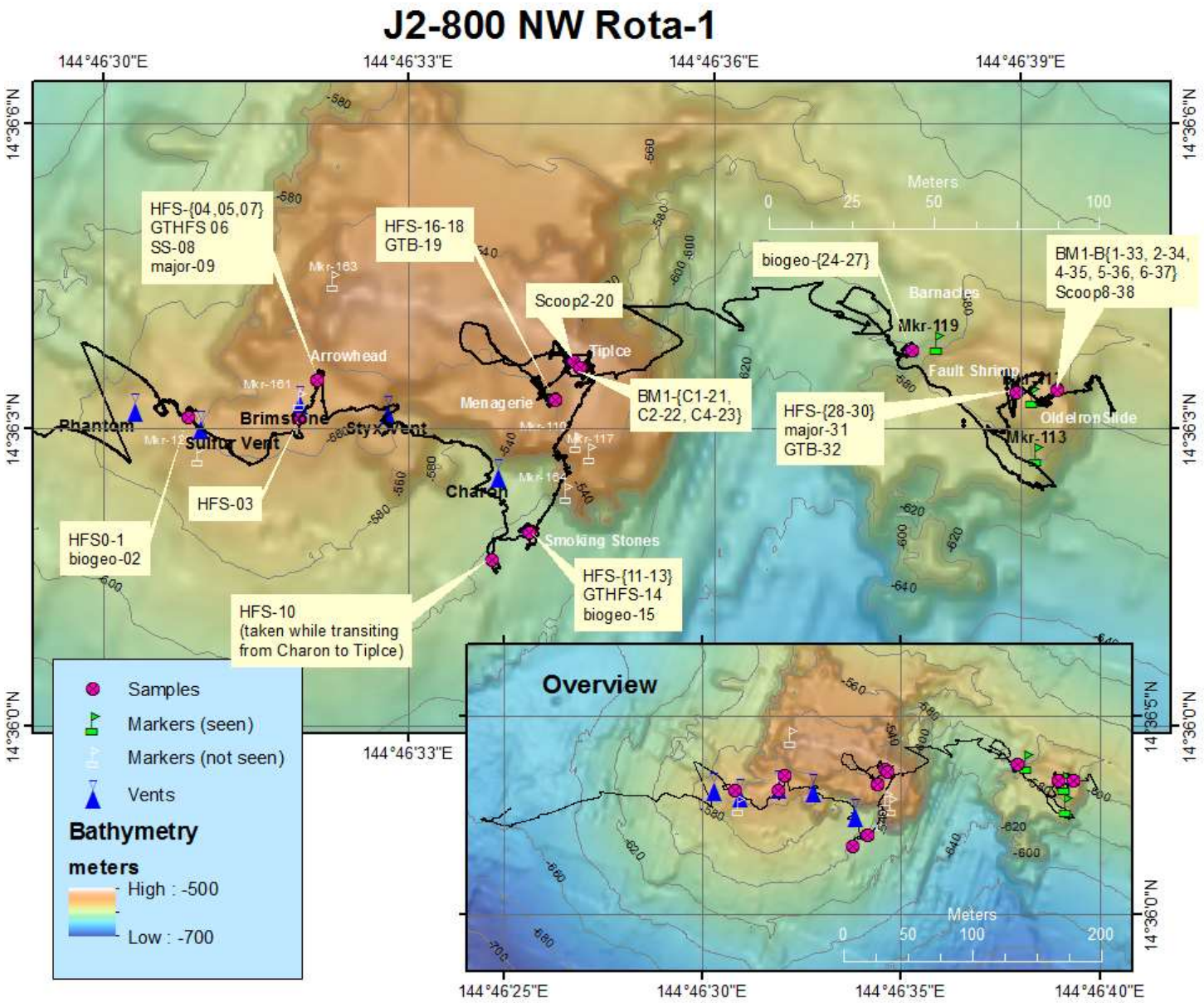
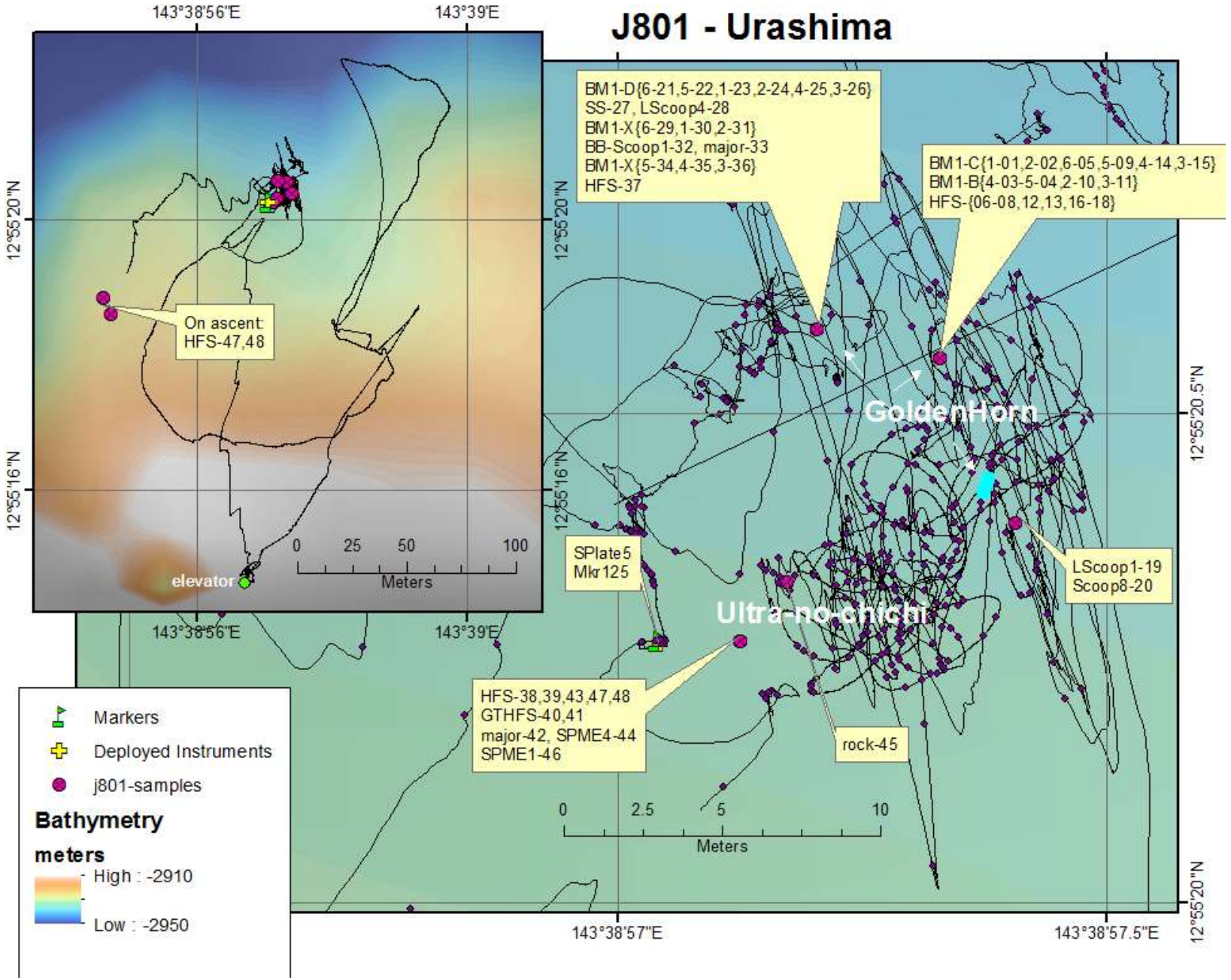


Fig. 5.5-6 J2-801



5-6 Dive Samples

5.6-1 J2-797 Samples:

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
7:55	J797-SPlate5-01	bio	Mkrs 20 & 24	Beaulieu settlement plate deployed in 2010. (Stace Beaulieu WHOI). Pates are black and perched on rocky outcrop in area with white microbial mat and macrofauna. T=~ambient. [Bucket lids with #20 and #24. Stace5 Jason target]	12 57.1888	143 37.1664	2848	289	406
9:16	J797-HFS-02	fluid	Mkr 114a site	Filtered bag #24. Tmax=16.7C; Tavg=10; T2=7; Vol=550mL. Area of yellow stained pillows and lava blocks. Background sensors: pH=3.693v; O2=280ml/L.	12 57.135	143 37.159	2845	1	564
9:20	J797-HFS-03	fluid	Mkr 114a site	Unfiltered bag #23. Tmax=17.5; Tavg=16.0; T2=0; Vol=550mL. Same spot as sample 2.	12 57.135	143 37.159	2845	1	578
9:21	J797-HFS-04	fluid	Mkr 114a site	RNA filter #16. Start 0921. Tmax=21.5; Tavg=13.8; T2=7; Vol=3000mL.	12 57.135	143 37.159	2845	1	591
9:41	J797-HFS-05	fluid	Mkr 114a site	RNA filter #15. Tmax=21.0; Tavg=14.2; %2=8; Vol=3000mL. Stop 20:01.	12 57.135	143 37.159	2845	1	598
11:45	J797-BM1-A2-07	bio	Mkr 108 site	Cassette A Syringe 1. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?) in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	773
11:47	J797-BM1-A3-08	bio	Mkr 108 site	Cassette A Syringe 3. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?) in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	775
11:52	J797-BM1-A5-09	bio	Mkr 108 site	Cassette A Syringe 5. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?) in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	784
11:54	J797-BM1-A4-10	bio	Mkr 108 site	Cassette A Syringe 4. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?) in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	787

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
11:58	J797-BM1-A1-11	bio	Mkr 108 site	Cassette A Syringe 1. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?) in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	794
12:00	J797-BM1-A6-12	bio	Mkr 108 site	Cassette A Syringe 6. This one fills the cassette. Sampling site: Fluffy yellow iron mat in hollow cavity (old pillow with Mn crust?)in shimmering water. Jason T > 60C.	12 57.166	143 37.142	2850	343	797
12:12	J797-BM1-D1-13	bio	Mkr 108 site	Cassette D Syringe 14. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water near last site. Jason T=27C. Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	309	811
12:14	J797-BM1-D6-14	bio	Mkr 108 site	Cassette D Syringe 6. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water near last site. Jason T=27C. Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	309	819
12:15	J797-BM1-D5-15	bio	Mkr 108 site	Cassette D Syringe 14. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water near last site. Jason T=27C. Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	309	822
12:24	J797-BM1-D3-16	bio	Mkr 108 site	Cassette D Syringe 14. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water next to last site. Jason T=57C.	12 57.166	143 37.142	2850	310	837
12:25	J797-BM1-D2-17	bio	Mkr 108 site	Cassette D Syringe 2. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water next to last site. Jason T=57C.	12 57.166	143 37.142	2850	310	839
12:26	J797-BM1-D4-18	bio	Mkr 108 site	Cassette D Syringe 2. Sampling site: Smaller than previous clump of fluffy yellow iron mat in shimmering water next to last site. Jason T=57C.	12 57.166	143 37.142	2850	310	840

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
12:40	J797-HFS-19	fluid	Mkr 108 site	Unfiltered bag # 17. Tmax=26; T2=12.3; tavg=34.9; Vol=550mL. Stop 1244 (in area of samples 13-15). Sensor readings for area: pH=3.15v; O2=1.51ml/L.	12 57.166	143 37.142	2850	310	862
13:07	J797-HFS-20	fluid	Mkr 108 site	Unfiltered piston #1. Start 1302. Stop 1306. Tmax=29.6; Tavg=28.5; T2=8; Vol=603mL. (in area of samples 7-12)	12 57.166	143 37.142	2850	334	897
13:15	J797-HFS-21	fluid	Mkr 108 site	Unfiltered piston #3. Start 1311. Stop 1315. Tmax=56.9; Tavg=51.9; T2=6.2 Vol=602ml. (Same area as sample 20 but in 60C water like samples 7-12)	12 57.166	143 37.142	2850	338	908
16:17	J797-HFS-22	fluid	Mkr 108 site	Filtered Piston #2. Start=16:14:40. Stop=16:16:57. Tmax=182.6C Tavg=162.8C T2=41.2C Vol=478mL (On top of Mrk24 bucket lid; high temp flow surrounded by sulfur mats and shrimp.)	12 57.187	143 37.160	2847	347	1239
16:18	J797-HFS-23	fluid	Mkr 24	Unfiltered Piston #5. Start= 16:18:21. Stop=16:21:21. Tmax=191.5C; Tavg=175.0C; T2=46C; Vol=473mL. (same location)	12 57.187	143 37.160	2847	347	1253
16:24	J797-GTHFS-24	gas	Mkr 24	GTHFS Purple. Temp:174C. (same location)	12 57.187	143 37.160	2847	347	1264
16:30	J797-Major-25	fluid	Mkr 24	White Major. (same location)	12 57.187	143 37.160	2847	347	1278
16:36	J797-Major-26	fluid	Mkr 24	Red Major. (same location)	12 57.187	143 37.160	2847	347	1288
16:44	J797-GTB-27	gas	Mkr 24	Red GTB. (same location)	12 57.187	143 37.160	2847	347	1303
5:01	J797-HFS-29	fluid	Baltan	Filtered piston #4. Start 05:01:50. Stop: 5:05:31. Tmax=169.3C; Tavg=163C; T2=51C; Vol=550mL. (High flow area; iron mat and sulfur with macrobio around; first called ""Active Chimney"")	12 55.340	143 30.951	2929	122	2310
5:06	J797-HFS-30	fluid	Baltan	Unfiltered piston #.7 Start 05:06:41. Stop: 05:10:18. Tmax=160.9C; Tavg=158C; T2=50C; Vol=550mL. (same location)	12 55.340	143 30.951	2929	122	2322
5:12	J797-GTHFS-31	gas	Baltan	White starboard GTHFS. Temp=160.9C. (same location)	12 55.340	143 30.951	2929	122	2337
5:15	J797-HFS-32	fluid	Baltan	Filtered piston #6. Start: 5:15:36. Stop: 5:19:17. Tmax=161C; Tavg=159C; T2=50C; Vol=530mL. (same location)	12 55.340	143 30.951	2929	122	2343

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
6:42	J797-BM1-C1-34	bio	Saipanda Horn	Cassette C Syringe 1. Sample site: bottom of skinny spire near top of Saipanda with soft iron oxide mats and clear flow. Jason T=19.9. Collected more material into Syringe 1 after sample 35.	12 55.333	143 38.950	2928	268	2492
6:44	J797-BM1-C2-35	bio	Saipanda Horn	Cassette C Syringe 2. Sample site: bottom of skinny spire near top of Saipanda with iron mats and clear flow. Jason T=19.9.	12 55.333	143 38.950	2928	268	2495
6:58	J797-BM1-C3-36	bio	Saipanda Horn	Cassette C Syringe 3. About 15cm below samples 34-35.	12 55.333	143 38.950	2928	268	2519
7:00	J797-BM1-C4-37	bio	Saipanda Horn	Cassette C Syringe 4. Same location as sample 36.	12 55.333	143 38.950	2928	268	2522
7:24	J797-HFS-38	fluid	Saipanda Horn	Unfiltered Bag 21. Start 07:20. Stop 07:24. Tmax=19; Tavg=16.9; T2=7; Vol= 525mL. Same location as sample 34-36 in flow. Background sensors: O2=2.25-2.30 for samples 38-40.	12 55.333	143 38.950	2928	268	2554
7:26	J797-HFS-39	fluid	Saipanda Horn	Filtered Bag 22. Start 07:24. Stop 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2557
7:35	J797-HFS-40	fluid	Saipanda Horn	Filtered bag 20. Start 07:33. Stop 07:35. Tmax=16.5; T2=7.4; Vol=495mL. top 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2568
7:45	J797-HFS-41	fluid	Saipanda Horn	Sterivex Filter 9. Start 07:45. Stop=08:09. Tmax=25.9; Tavg=16.7; T2=7; Vol= 3186mL. top 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2586
8:11	J797-HFS-42	fluid	Saipanda Horn	RNA Filter 13. Start=08:11. Stop=0:827. Tmax=23.4; Tavg=18.7; T2=7; Vol=3000mL. top 07:30. Tmax=18.7; Tavg=17.4; T2=7; Vol=525mL. (same location)	12 55.333	143 38.950	2928	268	2610
8:27	J797-HFS-43	fluid	Saipanda Horn	RNA Filter 14. Start= 08:27. Stop=08:44. Tmax=22.5; Tavg=17.9; T2=6.5; Vol=3000mL. (same location)	12 55.333	143 38.950	2928	268	2630
8:53	J797-SS-44	bio	Saipanda Horn	Sampling mats at same location as fluid samples.	12 55.333	143 38.950	2928	269	2659

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
9:14	J797-LScoop2-45	bio	Saipanda Horn	RNA Later scoop sample of the mats just above the suction sample 44.	12 55.333	143 38.950	2928	269	2696
11:10	J797-BM1-B2-47	bio	Snap Snap	Cassette B Syringe 2. Sample site: Fluffy-orange iron mats on small chimney-like structure with active flow.	12 55.333	143 38.950	2928	253	2884
11:12	J797-BM1-B1-48	bio	Snap Snap	Cassette B Syringe 1. (same location)	12 55.333	143 38.950	2928	253	2887
11:13	J797-BM1-B6-49	bio	Snap Snap	Cassette B Syringe 6. (same location)	12 55.333	143 38.950	2928	253	2889
11:24	J797-LScoop1-50	bio	Snap Snap	RNA Later scoop sample of iron bio mats. Starting scoop high on structure. Sample continued on a nearby chimney-like face with flow. Start at 11:24 and finished at 11:30.	12 55.333	143 38.951	2928	253	2907
11:50	J797-BBScoop1-51	bio	Snap Snap	Big Boy Sample of fluffy iron mat not far from sample 50. Sampled mat from a small chimney with nearby white mat.	12 55.332	143 38.952	2928	253	2950
12:04	J797-Sulfide-52	sulfide	near Shar-pen	Piece of active chimney in the area of Shar-pen. Crumbled but enough retained for sample.	12 55.339	143 38.950	2922	349	2969

5.6-2 J2-798 Samples:

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
9:12	J798-HFS-01	fluid	Champagne Site (at Mkr144)	Unfiltered piston #1. Start. 09:12. Stop 09:15. Tmax=16.9 Tavg=14.3 vol=400mL T2=6. (At Mrk-144 Champagne area. Flow area to right of a rock.)	21 29.2442	144 2.4851	1608	56	4395
9:19	J798-HFS-02	fluid	Champagne Site (at Mkr144)	Sterivex filter 9. Start 09:19. Stop 09:41. Tmax=26.5 Tavg-18.5 vol=3046mL T2=12.0. (same location)	21 29.2442	144 2.4851	1608	56	4406
9:42	J798-HFS-03	fluid	Champagne Site (at Mkr144)	Filtered piston #4 Start 09:42. Stop 09:47. Tmax=26.2. Tavg=25.2 Vol=450mL T2=12. (same location)	21 29.2442	144 2.4851	1608	56	4434
9:48	J798-GTHFS-04	gas	Champagne Site (at Mkr144)	Purple Port Fired 09:48. Tmax=26.2 (pH=4.3 for samples 1-4) (same location)	21 29.2442	144 2.4851	1608	56	4444

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
10:08	J798-HFS-05	fluid	Champagne Site (at Mkr144)	Filtered piston #2. Start 10:08. Stop 10:11. Tmax=70.9 Tavg=67. T2=25. Vol=451mL. (Champagne 6m NW of Mrk144. 70+C water from hole in sulfur and mat.)	21 29.2442	144 2.4851	1607	59	4475
10:12	J798-HFS-06	fluid	Champagne Site (at Mkr144)	Unfiltered piston #3. Start 10:12. Stop 10:15.Tmax=63; Tavg=56; T2= 21; Vol=451mL. (same location)	21 29.2442	144 2.4851	1607	59	4483
10:18	J798-HFS-07	fluid	Champagne Site (at Mkr144)	RNA filter 14. Start 10:18. Stop 10:35. Tmax=66.1; Tavg=65.1; T2=22.6; Vol=3001mL. (same location with a slight reposition of nozzle-little white chimlet next to nozzle)	21 29.2442	144 2.4851	1607	59	4491
10:36	J798-GTHFS-08	gas	Champagne Site (at Mkr144)	STBD white GTHFS. Tmax=66.1. (same location)	21 29.2442	144 2.4851	1607	59	4515
11:35	J798-HFS-09	fluid	Champagne Site (at Mkr144)	Unfiltered bag #17. Start 11:35. Stop 11:37. Tmax=17.6; Tavg=17.3; T2=18.5; Vol=303mL. (Moved back to base of Mkr-144 by slab of sulfur)	21 29.2442	144 2.4851	1606	65	4612
11:41	J798-HFS-10	fluid	Champagne Site (at Mkr144)	RNA (later)filter #16. Start 11:41. Tmax=20.0; Tavg=18.90; T2=9; Vol=3007mL. (same location) Sensors: pH=4.7 O2=1.6 for samples 9 and 10.	21 29.2442	144 2.4851	1606	65	4626
12:17	J798-BM-B2-11	bio	Champagne Site (at Mkr144)	Cassette B. Syringe 2. (White mat overlaid on sulfur at same location).	21 29.2442	144 2.4851	1606	67	4677
12:18	J798-BM-B1-12	bio	Champagne Site (at Mkr144)	Cassette B. Syringe 1. (same location)	21 29.2442	144 2.4851	1606	67	4681
12:19	J798-BM-B6-13	bio	Champagne Site (at Mkr144)	Cassette B. Syringe 6. (same location)	21 29.2442	144 2.4851	1606	67	4683
12:20	J798-BM-B5-14	bio	Champagne Site (at Mkr144)	Cassette B. Syringe 5. (same location)	21 29.2442	144 2.4851	1606	67	4685

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
12:21	J798-BM-B4-15	bio	Champagne Site (at Mkr144)	Cassette B. Syringe 4. (same location)	21 29.2442	144 2.4851	1606	67	4687
12:25	J798-BM-B3-16	bio	Champagne Site (at Mkr144)	Cassette B. Syringe 3. Different valve. (same location)	21 29.2442	144 2.4851	1606	67	4696
14:46	J798-BM-C1-17	bio	Yellow Cone (at Mkr146)	Cassette C. Syringe 1. Light yellow mat on top of darker orange mat. (From right of ShrimpTrap2)	21 29.2651	144 2.5188	1579	245	4950
14:55	J798-BM-C2-18	bio	Yellow Cone (at Mkr146)	Cassette C. Syringe 2. (same mat as sample 17)	21 29.2651	144 2.5188	1579	245	4963
15:21	J798-BM-C4-19	bio	Yellow Cone (at Mkr146)	Cassette C. Syringe 4. Repositioned slightly. Sampled thick mat above 30C flow.	21 29.2651	144 2.5188	1579	257	5028
15:31	J798-BM-C6-20	bio	Yellow Cone (at Mkr146)	Cassette C. Syringe 6. Slight reposition-still fluffy mat.	21 29.2651	144 2.5188	1579	253	5049
15:46	J798-HFS-21	fluid	Yellow Cone (at Mkr146)	Unfiltered Bag #1. Start 15:46. Stop 15:48. Tmax= 29.0C; Tavg= 27.3C; T2= 5C; Vol= 350mL.	21 29.2674	144 2.5194	1579	255	5072
15:49	J798-HFS-22	fluid	Yellow Cone (at Mkr146)	Filtered Bag #24 Start: 15:49. Stop: 15:51. Tmax= 30.5C; Tavg= 30.1C; T2= 7C; Vol= 353. Sensors: pH=5.42 O2=0.51ml/L.	21 29.2674	144 2.5194	1579	255	5078
15:58	J798-HFS-23	fluid	Yellow Cone (at Mkr146)	RNA Later Filter #15 Start 15:58. Stop 16:21. Tmax= 34.0 C; Tavg= 33.6 C; T2= 3-4C; Vol=3000 mL.	21 29.2674	144 2.5194	1579	255	5090
16:24	J798-BM-C3-24	bio	Yellow Cone (at Mkr146)	Cassette C. Syringe 3. Same as samples 19-20	21 29.2651	144 2.5188	1579	254	5124
17:30	J798-BM-D1-25	bio	Yellow Cone (at Mkr124)	Cassette D. Syringe 1. Sampling fluffy-covered chimney structure 10m from Mkr146.	21 29.2753	144 2.5201	1584	181	5234
17:37	J798-BM-D2-26	bio	Yellow Cone (at Mkr124)	Cassette D. Syringe 2. (same location)	21 29.2753	144 2.5201	1584	181	5253
17:38	J798-BM-D4-27	bio	Yellow Cone (at Mkr124)	Cassette D. Syringe 4. (same location)	21 29.2753	144 2.5201	1584	181	5256
17:42	J798-BM-D6-28	bio	Yellow Cone (at Mkr124)	Cassette D. Syringe 6. (same location)	21 29.2753	144 2.5201	1584	181	5262

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
17:44	J798-BM-D3-29	bio	Yellow Cone (at Mkr124)	Cassette D. Syringe 6. (same location)	21 29.2753	144 2.5201	1584	181	5268
18:06	J798-HFS-30	fluid	Yellow Cone (at Mkr124)	Filtered Bag 22 Start 18:06. Stop 18:09. Tmax=22.5; Tavg=21.9; T2=9; vol=450mL. Sensors: pH=5.36 O2=0.29mL/l (same location; tip in yellow mat)	21 29.2739	144 2.5189	1584	183	5295
18:10	J798-HFS-31	fluid	Yellow Cone (at Mkr124)	Unfiltered bag 21. Start 18:10. Stop 18:13 Tmax=23.0 Tavg=22.7 T2=9 vol=475mL.	21 29.2739	144 2.5189	1584	183	5300
18:15	J798-HFS-32	fluid	Yellow Cone (at Mkr124)	Sterivex filter 13. Start 18:15. Stop 18:32 Tmax=25.3 Tavg=24.0 T2=10 vol=3000mL.	21 29.2739	144 2.5189	1584	183	5307
20:03	J798-Major-33	fluid	Yellow Cone (at Mkr124)	Black Major fired. (same orifice as samples 30-32)	21 29.2739	144 2.5189	1584	215	5474
20:14	J798-LScoop3-34	bio	Yellow Cone (at Mkr124)	RNA Later Scoop (from mat on each side of hole of samples 30-33)	21 29.2739	144 2.5189	1584	215	5492
20:31	J798-Major-35	fluid	Yellow Cone (at Mkr124)	Yellow major. (same hole as samples 30-33)	21 29.2739	144 2.5189	1584	215	5520
21:54	J798-LScoop2-36	bio	Yellow cone	RNA Later Scoop. (from red iron mats near Shrimp Trap 1 about 5m S of Mkr-146)	21 29.2652	144 2.5185	1579	270	5678
2:39	J798-Mbag-37	bio	Razorback	Scoop of ~25 mussels. Scooped from 02:39-02:45. (Up the slope from Mkr-145).	21 29.2502	144 2.5086	1561	158	6097
2:59	J798-SS-38	bio	Razorback	Suction of shrimp and small mussels. (about 5m. From Mkr-145)	21 29.2502	144 2.5086	1561	165	6136
7:16	J798-HFS-39	fluid	Mid-water	Filtered Bag 20. Background water samples after Reson survey.	21 29.4238	144 2.6141	1733	51	6459
7:20	J798-HFS-40	fluid	Mid-water	Unfiltered Bag 19. Background water samples after Reson survey.	21 29.4238	144 2.6141	1725	190	6466

5.6-3 J799-Samples:

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
13:35	J799-PrTrp104-01	bio	Lower Yellow Cone - Mkr124	Recovered from steep slope in thick iron-oxide sediments. Sitting on top of MTR deployed at the same time. This site is at the edge of a steep ridge. Thick iron-oxide mat covering the seafloor here. Trap is beneath the marker ~1m.	21 29.2740	144 2.5189	1584	209	11860
13:57	J799-LScoop4-02	bio	Lower Yellow Cone - Mkr124	RNALater scoop in these deep iron-oxide sediments half way between Mkr-124 and 146. Tmax=20C.	21 29.2746	144 2.5211	1583	170	11885
14:24	J799-HFS-03	fluid	Lower Yellow Cone - Mkr124	Unfiltered Bag #23. Start Time: 14:24. Stop: 14:26. Tmax= 11.6C; Tavg= 11.0C; T2= 4.2C Vol= 400 mL. HFS Sensors: pH=5.24. O2=1.57ml/L. Same location sample #02 taken.	21 29.2746	144 2.5211	1583	170	11947
14:27	J799-HFS-04	fluid	Lower Yellow Cone - Mkr124	Filtered Bag #24. Start: 14:27. Stop Time: 14:29. Tmax= 12.3C; Tavg= 12.0C; T2= 4.2 C; Vol= 413mL. Same location as sample 2 & 3.	21 29.2746	144 2.5211	1583	170	11952
14:43	J799-ShrTrap1-05	bio	Upper Yellow Cone -Mkr146	Shrimp Trap #1 surrounded by shrimp and a couple inside. (Note that the Shrimp Trap #2 was left at the site since it didn't appear to have shrimp inside and the basket was going to be full).	21 29.2626	144 2.5232	1578	261	11983
14:48	J799-STrap1-06	bio	Upper Yellow Cone -Mkr146	Slide Trap1 recovered from the same location as the recovered Shrimp Trap; 2 other Slide Traps and MTR 4001.	21 29.2626	144 2.5232	1578	269	11991
14:49	J799-STrap2-07	bio	Upper Yellow Cone -Mkr146	Slide Trap2 recovered from the same location as the recovered Shrimp Trap; 2 other Slide Traps and MTR 4001.	21 29.2626	144 2.5232	1578	269	11992
14:50	J799-STrap3-08	bio	Upper Yellow Cone -Mkr146	Slide Trap3 recovered from the same location as the recovered Shrimp Trap; 2 other Slide Traps and MTR 4001.	21 29.2626	144 2.5232	1578	269	11995
15:08	J799-BM1-C1-09	bio	Upper Yellow Cone -Mkr146	Cassette C. Syringe 1. Bio mat sampler with ferrozine. Location is slightly above the site where the instruments/samples 5-8 were recovered where fluffier mat observed. In crevice with flow. HFS probe measured 10degC.	21 29.2626	144 2.5232	1578	268	12024

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
15:19	J799-BM1-D1-10	bio	Upper Yellow Cone -Mkr146	Cassette D. Syringe 1. Slight reposition below previous sample in mat with many shrimp. Light-colored mat surrounding good flow.	21 29.2635	144 2.5244	1580	245	12054
15:23	J799-BM1-D2-11	bio	Upper Yellow Cone -Mkr146	Cassette D. Syringe 2. Same location.	21 29.2635	144 2.5244	1580	245	12061
15:25	J799-BM1-D4-12	bio	Upper Yellow Cone -Mkr146	Cassette D. Syringe 4. Slightly left of sample 10-11 location in thick mat with crust on top	21 29.2635	144 2.5244	1580	245	12066
15:36	J799-HFS-13	fluid	Upper Yellow Cone -Mkr146	Unfiltered Piston #1. Start 15:36. Stop 15:39. Tmax= 33.4C; Tavg= 33.2C; T2= 16.2C; Vol= 601mL. HFS sensors T=30C pH=5.21 O2=1.19. Same location as samples 10-12 but moved probe around to find highest flow and temperature.	21 29.2635	144 2.5244	1580	245	12087
15:41	J799-GTHFS-14	gas	Upper Yellow Cone -Mkr146	HFS Gastight Starboard. Same location.	21 29.2635	144 2.5244	1580	245	12094
15:44	J799-BM1-C5-15	bio	Upper Yellow Cone -Mkr146	Cassette C. Syringe 5. Biomat sampler with ferrozine. Same flow as sample 13-15.	21 29.2635	144 2.5244	1580	245	12102
15:47	J799-BM-C4-16	bio	Upper Yellow Cone -Mkr146	Cassette C. Syringe 4. Biomat sampler with geochemistry filter. Same location.	21 29.2635	144 2.5244	1580	245	12110
15:57	J799-LScoop1-17	bio	Upper Yellow Cone -Mkr146	RNA-later scoop #1 in same location as samples 13-16. Crusty sample. Rock face of site is covered with shrimp.	21 29.2635	144 2.5244	1580	245	12125
16:21	J799-BM1-D6-18	bio	Upper Yellow Cone -Mkr146	Cassette D. Syringe 6. Crusty mat on top with flow. Location about 3 meters below sample 17.	21 29.2638	144 2.5243	1581	224	12168
16:22	J799-BM1-D5-19	bio	Upper Yellow Cone -Mkr146	Cassette D. Syringe 5. Same location as sample 18.	21 29.2638	144 2.5243	1580	230	12176
16:28	J799-BM1-D3-20	bio	Upper Yellow Cone -Mkr146	Cassette D. Syringe 3. Same location in light-fluffy mat under the crusty mat.	21 29.2638	144 2.5243	1580	230	12187
16:43	J799-BM1-B1-21	bio	Upper Yellow Cone -Mkr146	Cassette B. Syringe 1. New mat with crusty top and fluffy underneath.	21 29.2638	144 2.5243	1581	230	12219

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
16:48	J799-BM1-B6-22	bio	Upper Yellow Cone -Mkr146	Cassette B. Syringe 6. Same location.	21 29.2638	144 2.5243	1581	230	12229
16:49	J799-BM1-B5-23	bio	Upper Yellow Cone -Mkr146	Cassette B. Syringe 5. Same location.	21 29.2638	144 2.5243	1581	230	12231
16:55	J799-BM1-C3-24	bio	Upper Yellow Cone -Mkr146	Cassette C. Syringe 3. Biomat sampler with ferrozine. Same location.	21 29.2638	144 2.5243	1581	230	12239
17:05	J799-Lscoop3-25	bio	Upper Yellow Cone -Mkr146	Scoop #3. Scoop does not contain RNA-later. Very crusty with big chunks.	21 29.2638	144 2.5243	1581	230	12258
18:20	J799-SPlate4-26	bio	Razorback	Recovered Slate #4. (Below Mrk-145 on flatter area with Trap #113). T ambient=2.73C.	21 29.2498	144 2.5074	1566	157	12373
18:29	J799-PTrap113-27	bio	Razorback	Recovered Protist Trap #113. Same location but different heading with MTR 3173.	21 29.2498	144 2.5074	1566	174	12388
18:32	J799-biogeo-28	biogeo	Razorback	Rock with limpets and limpet egg casings. Same location as sample 27.	21 29.2498	144 2.5074	1566	174	12388
18:38	J799-HFS-29	fluid	Razorback	Filtered Piston #29. Same location as samples 27-28 (placed on either side of the structure) in flow at top of fragile sulfide structure. HFS sensors: pH=4.45 O2=1.45.	21 29.2498	144 2.5074	1566	173	12411
18:42	J799-HFS-30	fluid	Razorback	Unfiltered Piston #30. Same location and flow. Start 18:42. Stop 18:45. Tmax=20.6 Tavg=17.9 T2=7 vol=450 mL.	21 29.2498	144 2.5074	1566	173	12417
18:49	J799-ShrTrap4-31	bio	Razorback	Recovered Shrimp Trap #4. Next to Mrk-145 on top of ridge with mussels and squat lobsters. Many shrimp; undescribed species.	21 29.2435	144 2.494	1561	156	12440
18:53	J799-ShrTrap3-32	bio	Razorback	Recovered Shrimp Trap #3. Co-located with Shrimp Trap #3 and undeployed markers which were left behind.	21 29.2435	144 2.494	1561	156	12450

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
19:18	J799-HFS-33	fluid	Champagne - Mkr144	Sterivex #13 taken with wand in holster. Start 19:18. Stop 19:30. Tmax=3.0 Tavg=2.7 vol=2196 mL. Sample collection in background while recovering instruments (samples 34-35). 7m to the west of Mkr144.	21 29.2434	144 2.4938	1608	93	12514
19:20	J799-SPlate3-34	bio	Champagne - Mkr144	Slate #3 recovered at same location as sample 33. Co-located with MTR 3048 and Protist Trap #4.	21 29.2434	144 2.4938	1608	93	12520
19:24	J799-PTrap4-35	bio	Champagne - Mkr144	Recovered Protist Trap #4. Same location with slight heading adjustment for recovery. Recovered at same heading with MTR 3291.	21 29.2434	144 2.4938	1608	54	12535
19:39	J799-biomacro-36	bio	Champagne - Mkr144	Mussels scooped from above a white mat area very near samples 34-35. Using square-mouthed sampler. HFS sensors: pH=4.8 in the white mat. Start 19:39. Stop 19:41.	21 29.2498	144 2.4857	1608	71	12571
19:47	J799-HFS-37	fluid	Champagne - GoldenLips	Unfiltered Bag #19. Start 19:47. Stop 19:50. Tmax=2.7 Tavg=2.7 vol=473 mL. In clump of mussels. Location is to NW of previous sample on small ridge with mussel density increasing as move west away from sulfides. HFS sensor: pH=5.78.	21 29.2567	144 2.4813	1606	74	12597
19:53	J799-biomacro-38	bio	Champagne - GoldenLips	Scoop of mussels in high-mussel density location. Red rectangle scoop. Same location as HFS sample #37.	21 29.2567	144 2.4813	1606	74	12612
20:00	J799-HFS-39	fluid	Champagne - GoldenLips	Filtered Bag #20. Start 20:00. Stop 20:03. Tmax=2.8 Tavg=2.7 vol=550mL. Wand in holster while Jason securing basket before ascent. Same location as samples 37-38.	21 29.2567	144 2.4813	1606	74	12634
20:03	J799-GTHFS-40	gas	Champagne - GoldenLips	Port Purple GTHFS. Fired at same time HFS-39 being taken. T=2.8.	21 29.2567	144 2.4813	1606	74	12639

5.6-4 J800-Samples:

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
21:40	J800-HFS-01	fluid	Phantom	Unfiltered Bag #17. Start 21:40. Stop 21:44. Tmax=9.9 Tavg=9.5 T2=7.8 vol=500mL. In shimmering water with filamentous microbial mats and biota.	14 36.052	144 46.514	555	55	12862
21:48	J800-biogeo-02	biogeo	Phantom	Rock with limpets and egg cases. Same location as HFS sample-01 at Phantom Vent.	14 36.052	144 46.514	554	52	12875
22:07	J800-HFS-03	fluid	Brimstone	Filtered bag #18. Start 22:07. Stop 22:11. Tmax=9.2 Tavg=8.9 T2=7.5 Vol=500ml. In crevice on the way to Sulfur Crust in area with high shrimp concentration and bits of sulfur. HFS sensor: pH=6.12.	14 36.0518	144 46.532	551	38	12925
22:19	J800-HFS-04	fluid	Arrowhead	Filtered piston #2. Start 22:20. Stop 22:22. Tmax=102.3 Tavg=102 T2=33 Vol=450mL. Intense swarm of shrimp.	14 36.058	144 46.535	544	47	12953
22:25	J800-HFS-05	fluid	Arrowhead	Piston #3. Start 22:23. Stop 22:26. Tmax=101.6 Tavg=100.6 T2=34. Vol=450mL	14 36.058	144 46.535	544	47	12962
22:28	J800-GTHFS-06	gas	Arrowhead	Port gas-tight in same place as 2 previous HFS samples. Tmax=101.6	14 36.058	144 46.535	544	47	12970
22:29	J800-HFS-07	fluid	Arrowhead	Unfiltered Bag #24. Start 22:30 Stop 22:31. Tmax=101.8 Tavg=101.6 T2=33 Vol=450mL.	14 36.058	144 46.535	544	47	12973
22:36	J800-SS-08	bio	Arrowhead	Shrimp suction in same area as previous Arrowhead samples in area coated with white sulfur.	14 36.058	144 46.535	544	47	12983
22:38	J800-major-09	fluid	Arrowhead	Red major taken at same location as all other Arrowhead samples with Tmax=102C. Major was re-triggered as taking too long to fill. Sample looked good.	14 36.058	144 46.535	544	47	12989

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
23:06	J800-HFS-10	fluid	near Charon to TipIce	Sterivex #13. Background sample for Sheryl. HFS wand in holster as we transit. Sterivex paused at 1500ml and 23:13. Stop 01:38 near at TipIce. Tavg=6.9 Vol=4516mL. Sterivex #13. This sample was stopped mid-sample then re-started after many other sample	14 36.0287	144 46.5636	584	61	13042
23:26	J800-HFS-11	fluid	SmokingStones	Unfiltered bag #19. Start 23:26. Stop 23:29. Tmax=10.4 Tavg=10.2 T2=8. Vol=475mL. HFS sensor: pH=5.8 O2=1.0. Area of a lot of smoke around rocks but not very hot temperatures.	14 36.0330	144 46.5698	590	318	13083
23:29	J800-HFS-12	fluid	SmokingStones	Filtered bag #20. Start 23:30. Stop 23:32. Tmax=10.7 Tavg=10.4 T2=8.2 Vol=475mL.	14 36.0330	144 46.5698	590	318	13092
23:34	J800-HFS-13	fluid	SmokingStones	Sterivex #14. Start 23:34. Stop 23:46. Tmax=10.7 Tavg=10.0 T2=7.5 Vol=3000mL.	14 36.0330	144 46.5698	590	318	13099
23:47	J800-GTHFS-14	gas	SmokingStones	Stbd GTHFS. Fired 23:48. Temp=10.5.	14 36.0330	144 46.5698	590	318	13124
23:53	J800-biogeo-15	biogeo	SmokingStones	Rock from Smoking Stones with several limpets on it as well as egg cases. Rock looks like blocky lavas.	14 36.0330	144 46.5698	590	318	13134
0:45	J800-HFS-16	fluid	Menagerie	Unfiltered bag #23. Start 00:45. Stop 00:48. Tmax=18.8 Tavg=18.7 T2=11 Vol=476mL. HFS sensor: pH 5.59. O2=0.44. Area of diffuse flow coming through the rocks with filamentous bacteria mat and diverse biology.	14 36.0547	144 46.574	534	70	13262
0:49	J800-HFS-17	fluid	Menagerie	Filtered Bag #22. Start 00:49. Stop 00:52. Tmax=19.1 Tavg=18.6 T2=11 Vol=476.	14 36.0547	144 46.574	534	70	13271
0:53	J800-HFS-18	fluid	Menagerie	Sterivix #15. Start 00:53. Stop 01:06. Tmax=19.6 Tavg=19.4 T2=11. Vol=3000mL. Same position as previous HFS samples at Menagerie. HFS sensors: pH=5.67. O2=0.20 for last 3 samples.	14 36.0547	144 46.574	534	70	13279

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
1:16	J800-GTB-19	gas	Menagerie	Green GTB at same place but in slightly different part of the flow. Tmax was 19.6degC.	14 36.0547	144 46.574	534	70	13311
1:41	J800-Scoop2-20	bio	TipIce	Orange Scoop #2 at TipIce (looks like old Iceberg area from 2010). Temperature was 7.9C in the sediments (ambient was 6.9C).	14 36.061	144 46.577	527	10	13356
2:04	J800-BM1-C1-21	bio	TipIce	Cassette C. Syringe 1. At the same location at white sediments of TipIce.	14 36.060	144 46.578	526	64	13388
2:05	J800-BM1-C2-22	bio	TipIce	Cassette C. Syringe 2. Same location.	14 36.060	144 46.578	526	11	13391
2:07	J800-BM1-C4-23	bio	TipIce	Cassette C. Syringe 4. Same location.	14 36.060	144 46.578	526	11	13397
2:45	J800-biogeo-24	biogeo	Barnacles	Rock with barnacles at the Barnacles marker.	14 36.0629	144 46.6324	567	353	13459
2:46	J800-biogeo-25	biogeo	Barnacles	2 pieces of rock with barnacles and filamentous bacteria. Same location.	14 36.0629	144 46.6324	567	353	13462
2:47	J800-biogeo-26	biogeo	Barnacles	Small rock with filamentous bacteria and no barnacles.	14 36.0629	144 46.6324	567	353	13465
2:49	J800-biogeo-27	biogeo	Barnacles	Large rock with barnacles and bacteria as well as a small piece of rock. Jason sensor: For these samples at Barnacles T=7.03C. Ambient temperature was 6.8C.	14 36.0629	144 46.6324	567	353	13467
3:27	J800-HFS-28	fluid	Crab Cavern@Fault Shrimp	Unfiltered Piston #1. Start 03:27. Stop. 03:30. Tmax=10.7 Tavg=10.6 T2=7.9 vol=550mL. HFS sensor: pH=6.0.	14 36.056	144 46.6495	565	52	13549
3:31	J800-HFS-29	fluid	Crab Cavern@Fault Shrimp	Filtered Piston #4. Start 03:31. Stop 03:34. Tmax=10.5 Tavg=10.4 T2=7.8 vol=550 mL. Same location.	14 36.056	144 46.6495	565	52	13561
3:36	J800-HFS-30	fluid	Crab Cavern@Fault Shrimp	Unfiltered Bag #21. Start 03:36. Stop 03:39. Tmax=10.4 Tavg=10.3 T2=7.7 vol=500mL.	14 36.056	144 46.6495	565	52	13571
3:43	J800-major-31	fluid	Crab Cavern@Fault Shrimp	White major at Crab Cavern. Tmax was 10.4 in this site. Same location.	14 36.056	144 46.6495	565	51	13582

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
3:48	J800-GTB-32	gas	Crab Cavern@Fault Shrimp	Red gas-tight bottle at Crab Cavern. Could not view intake but nozzle was in cavern. Same location.	14 36.056	144 46.6495	565	49	13591
4:08	J800-BM1-B1-33	bio	OldeIronSlide	Cassette B. Syringe 1. In flow above anemone. HFS temp=11.5C (ambient 7.1).	14 36.0563	144 46.656	567	317	13639
4:09	J800-BM1-B2-34	bio	OldeIronSlide	Cassette B. Syringe 2. Same location.	14 36.0563	144 46.656	567	318	13642
4:11	J800-BM1-B4-35	bio	OldeIronSlide	Cassette B. Syringe 4. Same location.	14 36.0563	144 46.656	567	319	13645
4:16	J800-BM1-B5-36	bio	OldeIronSlide	Cassette B. Syringe 5. Same location. Pulled sample twice to fill.	14 36.0563	144 46.656	567	321	13650
4:18	J800-BM1-B6-37	bio	OldeIronSlide	Cassette B. syringe 6. Moved slightly to large patch of material.	14 36.0563	144 46.656	567	11	13661
4:22	J800-Scoop8-38	bio	OldeIronSlide	Gray scoop #8. Same location.	14 36.0563	144 46.656	567	11	13678

5.6-5 J801-Samples:

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
18:28	J801-BM1-C1-01	bio	GoldenHorn base	Cassette C. Syringe 1. Geochem filter. Pulling water just above mat. Temperature measured at 20.5C before sample.	12 55.3426	143 38.9555	2930	153	13901
18:32	J801-BM1-C2-02	bio	GoldenHorn base	Cassette C. Syringe 2. Ferrozine in syringe. Same location as previous. Color change observed.	12 55.3426	143 38.9555	2930	153	13909
18:38	J801-BM1-B4-03	bio	GoldenHorn base	Cassette B. Syringe 4. RNA later at same location on chimney as samples 1-2.	12 55.3426	143 38.9555	2930	153	13920
18:39	J801-BM1-B5-04	bio	GoldenHorn base	Cassette B. Syringe 5. RNA later syringe. Same location.	12 55.3426	143 38.9555	2930	153	13923
18:40	J801-BM1-C6-05	bio	GoldenHorn base	Cassette B. Syringe 6. RNA later syringe. Sample appears to have been pulled at the same time as Syringe 5 (sample-04).	12 55.3426	143 38.9555	2930	153	13927

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
19:00	J801-HFS-06	fluid	GoldenHorn base	Unfiltered Bag #17. Start 19:00. Stop 19:04. Tmax=14.5 Tavg=13.1 T2=5.1 vol=575mL. Taken at same location as samples 1-5. In the upper part of the fluffy mat. HFS Sensors: O2=108uM pH=5.68 at T=11.8C. Jason O2 in holster=132.5uM.	12 55.3426	143 38.9555	2930	153	13961
19:05	J801-HFS-07	fluid	GoldenHorn base	Filtered Bag #18. Start 19:05. Stop 19:08 Tmax=10.0 Tavg=8.2 T2=4.0 vol=575mL. Same location.	12 55.3426	143 38.9555	2930	153	13967
19:17	J801-HFS-08	fluid	GoldenHorn base	Sterivex #13. Start 19:17. Stop. 19:31 Tmax=30.2 Tavg=25.0 T2=9.4 vol=3000mL. Repositioned to upper portion of fluffy mat. HFS sensor: O2=75uM at 38decC (O2=1.69xx).	12 55.3426	143 38.9555	2930	154	13988
20:01	J801-BM1-C5-09	bio	GoldenHorn middle	Cassette C. Syringe 5. Geochem filter-water only. Position 2m higher on the chimney than the previous samples at the base. Jason sensor: Temp=27.5C.	12 55.3426	143 38.9555	2928	132	14068
20:06	J801-BM1-B2-10	bio	GoldenHorn middle	Cassette B. Syringe 2. RNA Later sample. Same location. (Note syringe 1 started to pull prematurely at same time).	12 55.3426	143 38.9555	2928	132	14081
20:11	J801-BM1-B3-11	bio	GoldenHorn middle	Cassette B. Syringe 3. RNA Later sample. Same location. Jason sensors: O2=127.6uM in sample site. Ambient O2=131.0uM.	12 55.3426	143 38.9555	2928	132	14089
20:30	J801-HFS-12	fluid	GoldenHorn middle	Unfiltered Bag #19. Start 20:30. Stop 20:33. Tmax=10.3 Tavg=8.5 T2=5 vol=575mL. HFS sensor: O2=114uM pH=5.95 (check) at T=7-8degC. Same location.	12 55.3426	143 38.9555	2928	132	14129
20:40	J801-HFS-13	fluid	GoldenHorn middle	Filtered Bag #20. Start 20:40. Stop 20:44. Tmax=10.4 Tavg=10.1 T2=4.5 vol=575mL. Wand tip moved slightly to get temperature rise. HFS sensor: O2=108uM. pH=5.9 (check).	12 55.3426	143 38.9555	2928	132	14146
21:13	J801-BM1-C4-14	bio	GoldenHorn top	Cassette C. Syringe 4. Ferrozine syringe. Pulled just under 20mL. At chimney near top of GoldenHorn. Jason sensor: T=28.06C before sampling.	12 55.3426	143 38.9555	2922	167	14210

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
21:17	J801-BM1-C3-15	bio	GoldenHorn top	Cassette C. Syringe 3. Geochem filter. Intake tip in flow.	12 55.3426	143 38.9555	2922	167	14219
21:33	J801-HFS-16	fluid	GoldenHorn top	Filtered Piston #8. Start 21:33. Stop 21:37. Tmax=15.9 Tavg=11.6 T2=5 vol=700mL. In flow near top of chimney. HFS sensor: O2=89uM at T=19C.	12 55.3426	143 38.9555	2922	167	14248
21:38	J801-HFS-17	fluid	GoldenHorn top	Unfiltered Piston #7 Start 21:38. Stop 21:42. Tmax=12.8 Tavg=12.6 T2=5.2 vol=640mL.	12 55.3426	143 38.9555	2922	167	14258
21:43	J801-HFS-18	fluid	GoldenHorn top	Sterivex #14. Start 21:43. Stop 21:59. Tmax=14.1 Tavg=12.1 T2=5.3 Vol=3000mL. Same location near top of GoldenHorn. No sample.	12 55.3426	143 38.9555	2922	167	14265
22:32	J801-LScoop1-19	bio	GoldenHorn base	LScoop-1 at the base of GoldenHorn where samples 1-8 were taken. Not in direct flow. Orange-golden iron mat. Jason sensor: Temp=63C in direct flow.	12 55.3398	143 38.9568	2928	293	14355
22:48	J801-Scoop8-20	bio	GoldenHorn base	Scoop #8 (no fixative). Same location as sample-19.	12 55.3398	143 38.9568	2928	293	14390
3:05	J801-BM1-D6-21	bio	GoldenHorn top	Cassette D. Syringe 6. Normal syringe. Taken in flow at spire slightly below top of GoldenHorn. (Sampling after visit to elevator).	12 55.3431	143 38.9534	2923	176	14727
3:06	J801-BM1-D5-22	bio	GoldenHorn top	Cassette D. Syringe 5. RNA later syringe. Same location.	12 55.3431	143 38.9534	2923	176	14733
3:07	J801-BM1-D1-23	bio	GoldenHorn top	Cassette D. Syringe 1. RNA later syringe. Same location.	12 55.3431	143 38.9534	2923	176	14735
3:10	J801-BM1-D2-24	bio	GoldenHorn top	Cassette D. Syringe 2. Normal syringe. Same location.	12 55.3431	143 38.9534	2923	176	14740
3:12	J801-BM1-D4-25	bio	GoldenHorn top	Cassette D. Syringe 4. Normal syringe. Same location.	12 55.3431	143 38.9534	2923	176	14745
3:16	J801-BM1-D3-26	bio	GoldenHorn top	Cassette D. Syringe 3. RNA later syringe. Same location. Very little sample obtained.	12 55.3431	143 38.9534	2923	176	14752
3:25	J801-SS-27	bio	GoldenHorn top	Suction sample of fluffy iron mat. Started suction high on chimney and worked downward. Suction from 03:27-03:38.	12 55.3431	143 38.9534	2923	176	14768

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
3:51	J801-LScoop4-28	bio	GoldenHorn top	RNA Later scoop (orange). Side of peak. RNA chamber open before sample collected.	12 55.3431	143 38.9534	2922	211	14801
4:09	J801-BM1-X6-29	bio	GoldenHorn base	Cassette X. Syringe 6. Lighter mats at top of fluffy mat area near the base of GoldenHorn with flow coming from two holes. Veil-like.	12 55.3431	143 38.9534	2929	146	14835
4:11	J801-BM1-X1-30	bio	GoldenHorn base	Cassette X. Syringe 1. Same stuff.	12 55.3431	143 38.9534	2929	146	14841
4:12	J801-BM1-X2-31	bio	GoldenHorn base	Cassette X. Syringe 2. Same place.	12 55.3431	143 38.9534	2929	146	14845
4:20	J801-BB-scoop1-32	bio	GoldenHorn base	Same mat as X Cassette samples at base. Chunk of mat with structure. Rock in top of scoop.	12 55.3431	143 38.9534	2931	139	14855
4:43	J801-major-33	fluid	GoldenHorn base	Black Major. Same location as T=74C measured before sample taken.	12 55.3431	143 38.9534	2930	135	14893
4:56	J801-BM1-X5-34	bio	GoldenHorn middle	Cassette X. Syringe 5. Fluffy veil-like mat with mixture of textures.	12 55.3431	143 38.9534	2928	96	14920
4:57	J801-BM1-X4-35	bio	GoldenHorn middle	Cassette X. Syringe 4. Same material and location..	12 55.3431	143 38.9534	2928	96	14924
4:59	J801-BM1-X3-36	bio	GoldenHorn middle	Cassette X. Syringe 3. Same material and location.	12 55.3431	143 38.9534	2928	96	14929
5:07	J801-HFS-37	fluid	GoldenHorn top	Sterivex Filter #10. Start 05:07. Stop 05:23. Tmax=11.8 C; Tavg= 9.6C; T2=4.0C; Vol= 3004mL. HFS sensor: pH=5.68. O2=2.43mL/l.	12 55.3431	143 38.9534	2922	185	14948
5:34	J801-HFS-38	fluid	Ultra-no-chichi	Filtered Piston #2. Start 05:35. Stop 05:37. Tmax= 184.2C; Tavg= 179.3C; T2=58.9C; Vol= 554mL.	12 55.3378	143 38.9521	2929	132	14993
5:38	J801-HFS-39	fluid	Ultra-no-chichi	Unfiltered Piston #3. Start 05:38. Stop 05:41. Tmax= 178.7C; Tavg= 173.3C; T2= 57.3C; Vol= 554ml.	12 55.3378	143 38.9521	2929	132	15000
5:43	J801-GTHFS-40	gas	Ultra-no-chichi	Starboard Red-Green Gas-tight #7. Temperature 178-184degC.	12 55.3378	143 38.9521	2929	132	15006
5:43	J801-GTHFS-41	gas	Ultra-no-chichi	Port Black Gas-tight #5. Temperature 178-184degC.	12 55.3378	143 38.9521	2929	132	15007

Time UTC	Sample	Type	Site	Comments	Latitude	Longitude	Depth	Gyro	Virtual Van #
5:53	J801-major-42	fluid	Ultra-no-chichi	Red Major. Same location as GTHFS samples 41 and 42. Exhaust verified. Temperature 178-184degC. HFS sensors: O2=2.1mL/l (=94uM) where sampled for samples 40-42.	12 55.3378	143 38.9521	2929	132	15020
6:08	J801-HFS-43	fluid	Ultra-no-chichi	Unfiltered Piston #5. Start 06:08. Stop 06:11 Tmax=17.3 Tavg=16.3 T2=8 vol=600mL. Location is the shrimp habitat in the flow.	12 55.3378	143 38.9521	2929	123	15049
6:18	J801-SPME4-44	bio	Ultra-no-chichi	SPME #4. (Solid Phase Micro Extraction). Sampler held over flow at angle to maximally expose tubes to flow. Squeezed for six minutes in flow. Stop 06:24.	12 55.3378	143 38.9521	2929	123	15065
6:38	J801-rock-45	geo	Ultra-no-chichi	Piece of crumbly-small chimney near taken from near top of chimney. View of Marker 124 and deployed SPlates in background (just deployed).	12 55.3388	143 38.9529	2929	319	15103
6:45	J801-SPME1-46	bio	ascent	Background SPME #1 sample during ascent. Ambient Temperature=1.53C. Depth of squeeze: 2828-2667. Squeezed six minutes.	12 55.31	143 38.912	0	0	15117
6:57	J801-HFS-47	fluid	ascent	Unfiltered Bag #23. Background water sample. Start 06:47. Stop 07:02. Depths 2525-2388.	12 55.314	143 38.91	0	0	15132
7:01	J801-HFS-48	fluid	ascent	Filtered Bag #24. Start 07:02. Stop 07:05 Depths 2376-2262.	12 55.315	143 55.315	0	0	15138

Appendix:

NOTE: This version of the cruise report does not contain the printed dive logs, pages 121-244. The complete version can be obtained through the link provided below.

Metadata and data from this expedition has been submitted to the Marine Geoscience Data System available at:

www.marine-geo.org

The expedition ID for this cruise is RR1413.

The Jason Virtual Van, 2014→ SRoF14-Ironman [rr1413], is available for this expedition's dives at:

http://4dgeo.whoi.edu/jason/

The SRoF2014-Ironman cruise report (with and without the dive logs) and data can be obtained at:

http://www.pmel.noaa.gov/eoi/marianas_site.html/

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