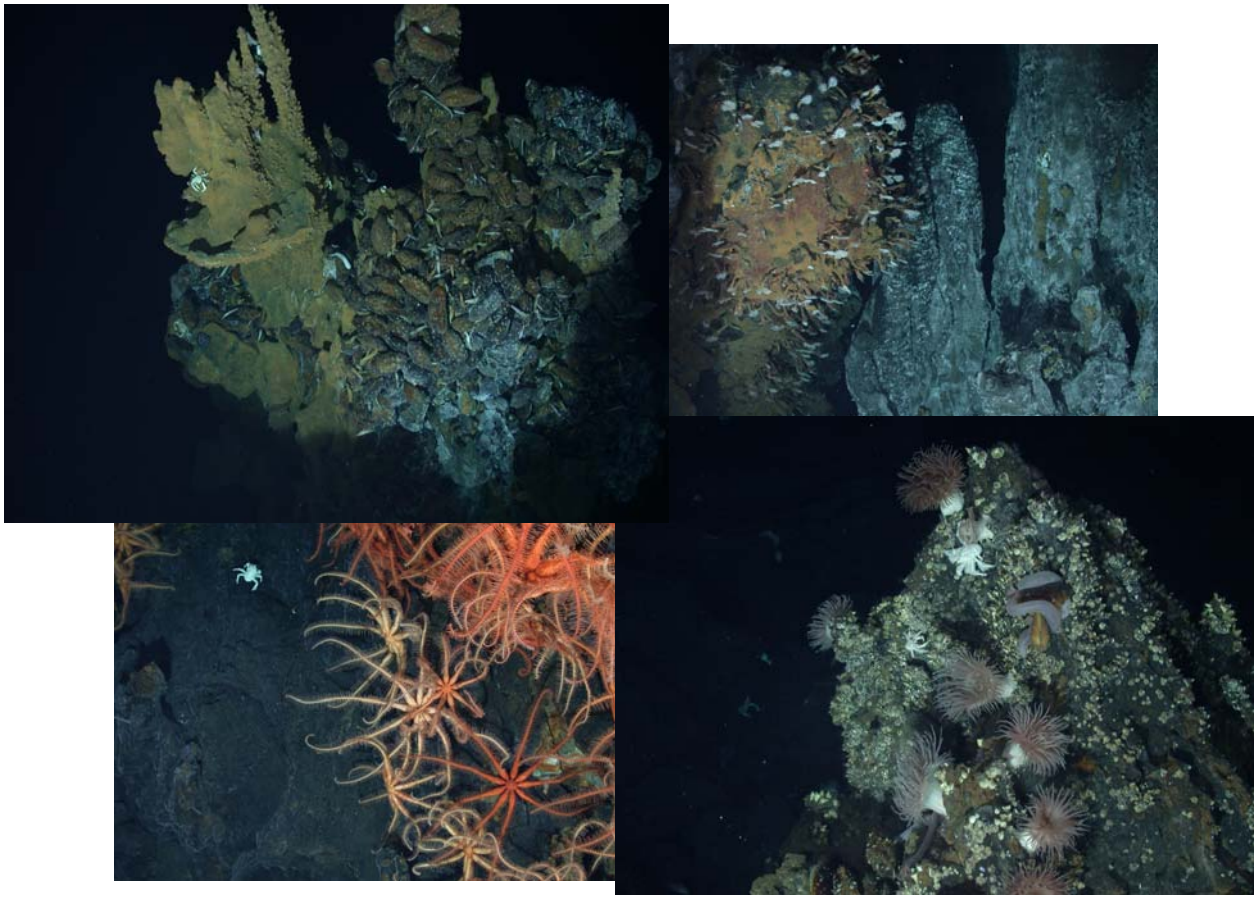
TUIM05MV – RV Melville/DSV Jason2
LAU Basin Vent Characterization Cruise
April 5-May 7, 2005
Tonga – Tonga



Funded by the NSF RIDGE2000 Program

P.I.s: M.K. Tivey, J. Seewald (Woods Hole Oceanographic Institution), C.G. Wheat (University of Alaska), M. Mottl (University of Hawaii), A-L. Reysenbach (Portland State University), S. Kim (Moss Landing Marine Lab)
Science Party: C. Agee, A. Banta, A. Bowen, J. Calderwood, A. Collasius, C. Colt, P. Craddock, T. Crook, R. Elder, V. Ferrini, P. Forte, S. Gegg, K. Hammerstrom, R. Harper, S. Kelly, T. McCollom, A. Moala, B. Nichols, J. Oakden, C. Offinger, G. Proskurowski, E. Reeves, J. Sharkey, M. Stephens, A. Sterling, S. Vailea, M. Voytek, R. Waters, R. Zook

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Personnel List

Scientific personnel/responsibilities

Chief Scientist	Meg Tivey
Jason Group	Andy Bowen, Expedition Leader
	Watches – Pilot/Engineer/Navigator
	Phil Forte/Bob Elder/Tom Crook
	Bob Waters/Tito Collasius/Cathy Offinger
	Andy Bowen/Casey Agee/Steve Gegg
	Watch leaders/DVD-virtual van/sci camera
	Meg Tivey/Amy Banta/Jim Oakden
	Stacy Kim/Paul Craddock/Eoghan Reeves
	Anna-Louise Reysenbach/Mary Voytek/Kamille Hammerstrom
Mapping	Vicki Ferrini, Akel Sterling
Vent deposits	Meg Tivey, Paul Craddock, Apai Moala, Siale Vailea
Vent fluids	Mike Mottl, Jeff Seewald, Geoff Wheat, Tom McCollom, Giora Proskurowski, Eoghan Reeves, Jessica Sharkey
Mega fauna/ MOCNESS	Stacy Kim (PI), Kamille Hammerstrom, Jim Oakden, Bob Zook
Microbiology	Anna-Louise Reysenbach (PI), Amy Banta, Sara Kelly, Mary Voytek
CTD	Mike Mottl, Geoff Wheat (PIs), John Calderwood, Jessica Sharkey, Eoghan Reeves, Paul Craddock, Sara Kelly, Amy Banta, Mark Stephens, Bryan Nichols
Radioisotopes in fluids/particles	Mark Stephens
Res Tech	Cambria Colt
Electronics Tech	John Calderwood
Computer Tech	Rob Harper
Outreach	Bryan Nichols

Ship's personnel/responsibilities

Master	Christopher Curl	*Chief Engineer*	Dennis Barclay
1st Officer	Wesley Hill	*1st Asst Engr*	Joel Rebelo
2nd Officer	Joseph Ferris	*2nd Asst Engr*	Ernest Juhasz
3rd Officer	Melissa Turner	*3rd Asst Engr.*	Keith Deirup
Boatswain	William Kamholz	*Electrician*	John Boing
Able Seaman	David Grimes	*Oiler*	Michael Hotchkiss
Able Seaman	Patrick Brandon	*Oiler*	Kevin Marlow
Able Seaman	Cletus Finnell	*Oiler*	Manuel Ramos
OS	Paul Shute	*Wiper*	Robert Juhasz
Sr. Cook	Robert Seeley	*Wiper*	David Walker
Cook	Edward Miller		

Summary of cruise:

The first week of work on TUIM05MV included successful characterization of two recently discovered vent fields on the Eastern Lau spreading axis at 20º3.2'S (the Kilo Moana vent field) and 20º19'S (the TowCam vent field). Evidence for these fields was first noted during a cruise in April 2004 on the R/V Kilo Moana (F. Martinez, Chief Scientist), with more precise locations determined during a cruise in September 2004, also on the R/V Kilo Moana, using the Autonomous Benthic Explorer ABE (C. Langmuir, Chief Scientist). Using data from these two previous cruises the ROV Jason2 found the active vent fields. It then carried out detailed down-looking camera/SM2000 bathymetric surveys in several areas of hydrothermal activity within each field, and recovered multiple rock (basalt and sulfide), biological, and vent fluid samples. Microbiological samples were taken from the active sulfide and diffuse fluid samples. At the Kilo Moana vent field there are three areas of active venting, and at the Tow Cam vent field there is an area of vigorous venting in the north, an area of less vigorous activity along a scarp in the south, and several patches of diffuse venting supporting lush biological communities. CTD casts and MOCNESS tows were successfully carried out over both of these fields to collect plume particles and larval plankton, respectively.

During the second week of work, the ABE Vent Field at 20º45'S was characterized, and a first dive was made at the Mariner Vent Field at 22º10.82'S. These vent fields were located by Jason2 using data collected during the Martinez et al. and Langmuir et al. cruises, and during the September 2004 Shinkai 6500 cruise (K. Takai, Chief Scientist). At the ABE Vent Field, Jason2 carried out detailed down-looking camera/SM2000 bathymetric surveys in three areas of hydrothermal activity, and recovered multiple rock, biological, and vent fluid samples. Jason2 made one dive at the Mariner Vent Field where a high altitude (20+ m off bottom) SM2000 survey was carried out over a 100 m by 140 m area to delineate the locations and sizes of several 10 to >25 m tall, narrow massive sulfide structures; 4 vent fluid and 2 chimney samples were collected. Also during week two, CTD casts were carried out over the ABE, Mariner, and Vai Lili Vent Fields, and a MOCNESS tow successfully recovered larval plankton from the plume above the Mariner Vent Field. With winds and seas increasing, and with Jason2 exhibiting a problem with its hydraulic system, Jason2 activities were on hold from the evening of April 16 through April 21. As a consequence, cruise activities switched to searching for additional active vent fields. Following up on plume data collected on the Martinez et al. cruise and compiled by Ed Baker and Joe Resing (pers. comm.), CTD tow yos from ~22ºS to 21º55'S were carried out to document the locations of non-buoyant plumes and a buoyant plume. Further CTD casts were used to pinpoint the source of venting near 21º59.4'S. CTD activities continued until seas were calm enough for a test dive to determine whether the Jason2 hydraulic problem had been fixed.

The highlight of the third week of work was the discovery of the large active vent field at 21º59'S on the Valu Fa Ridge, named Tui Malila. The location was determined from CTD tows, and active venting was discovered within 85 minutes of reaching the seafloor on Jason2 dive J2-132. An area 160m x 320m was mapped using SM2000, followed by near bottom observations and sampling. In the central part of the field there is an area of diffuse flow with abundant organisms. The southwestern 150m (S to N) x ~80m (W to E) area is actively venting, with multiple structures of coalesced spires and, in some areas, flanges. Other work during week three included a second dive at the Mariner Vent Field and a first dive at the Vai Lili Vent Field. During each dive, SM2000 surveys were done, and rock, biological, and vent fluid samples were collected. CTD casts were carried out over the Mariner and Tui Malila vent fields, MOCNESS

tows were done above the Vai Lili and Tui Malila vent fields, and CTD tow-yos were carried out at 21º6.4'S to further delineate the location of active venting. Weather again became an issue, with high seas forcing Jason2 to surface early and preventing Jason2 work for 3 days.

The focus of the fourth week of work was on completing the characterization of the six vent fields visited during the first three weeks of the cruise. Weather caused significant problems, with no activities allowed on Sunday and half of Monday. On other days the weather did allow CTD and MOCNESS activities to collect plume particles and larval plankton, respectively. Successful MOCNESS tows were carried out over the Tui Malila and ABE vent fields, and successful CTDs were carried out at Tui Malila, Tow Cam and Kilo Moana. The weather also allowed three Jason2 dives to be made. These included a second dive at the Tui Malila vent field, during which the northern and southern extents of activity at this field were constrained: two new areas of active venting were found to the north, and no additional activity to the south. Dives were also made to complete mapping and sampling at the Mariner and Vai Lili vent fields (a single dive with a four hour transit by Jason2 between fields), and at the ABE vent field. Transponders were recovered from the Vai Lili/Mariner area, and the 21º6'S area.

During the final week of work on TUIM05MV weather improved greatly and 3 dives were made on 3 consecutive days at Kilo Moana, Tui Malila, and Tow Cam vent fields to complete sampling and mapping, and transponders were recovered from the Tui Malila vent field. This cruise was funded through the NSF RIDGE2000 program as part of a five cruise series to aid in identifying the "bull's eye" of the Lau Basin Integrated Study Site.

Table 1. Numbers of samples collected from each vent field on TUIM05MV.

	Kilo Moana	Tow Cam	ABE	Tui Malila	Mariner	Vai Lili	Total
High T fluid [max T]	13 (7 vents) 333ºC	12(6vents) 328ºC	12(6vents) 309ºC	13 (8 vents) 312ºC	11(5 vents) 363ºC	6(2vents) 121ºC	67
Low T fluid	1 (1 vent)	2 (1 vent)	4 (3 vents)	2 (2 vent)	3 (2 vent)	2 (1 vent)	14
Active vent deposit	10 (5 w/fluid)	9 (4 w/fluid)	8 (4 w/fluid)	10 (5 w/fluid)	6 (3 w/fluid)	1 (w/fluid)	44
Inactive vent deposit	4	4	5 + scoop	12 + 2 scoop	2 + scoop	3	30+4 scoop
Substrate	5	5	8	8	2	4	32
Megafauna	12	14	10	7	2+2 mat	1+2 mat	46+4 mat

Acknowledgments:

The success of this cruise reflects the efforts of many people at shore and at sea. We gratefully acknowledge the Ministry of Foreign Affairs of the Kingdom of Tonga for permission to conduct scientific research in their jurisdiction, and Kelepi Mafi of the Ministry of Lands, Survey and Natural Resources for arrangements; Rose Dufour and Liz Brenner for pre-cruise logistics; Captain Chris Curl and the officers and crew of the RV Melville, and Andy Bowen and the Jason-2 operational team, for extraordinary efforts to work in often rough sea conditions; the shipboard technicians, particularly Cambria Colt and John Calderwood, for help with Jason-2 launch/recovery and for CTD and MOCNESS operations; Ken Takai, Fernando Martinez, Ed Baker, Joe Resing, Charlie Langmuir, Dan Fornari, Tim Shank, and Dana Yoerger for data and information that made it possible to quickly find known sites of venting. This work was funded by the NSF Ridge2000 Program, which encouraged sharing of information vital to our success.

Introduction:

The TUIM05MV cruise to Lau Basin was an interdisciplinary study, using the ROV *Jason2*, MOCNESS tows, and CTD lowerings, to identify the range in vent fluid and vent deposit variability at major vent fields along the Eastern Lau Spreading Center (ELSC) and the key processes and variables that influence fluid chemistry, sulfide deposit formation, and the range of habitats available for biological communities. In addition, the molecular and physiological diversity of associated microbes, the distribution and reproductive status of dominant megafaunal organisms present in the vicinity of hot-springs, and the distribution of plankton and larvae in the overlying water column were studied and will be related to the environmental conditions present at each vent field.

This cruise served as the third of five designed to provide needed background information to the NSF RIDGE2000 Program to identify the location for a back-arc basin RIDGE Integrated Study Site. The focus on portions of the relatively simple Lau Basin spreading system south of 19ºS (the ELSC) reflects the systematic changes in geomorphology, petrology, crustal structure, spreading rate, and distance to the associated volcanic arc that occur along the ridge. Spreading rates decrease from 96 mm/yr in the north to 39 mm/yr in the south, with the ELSC propagating south into stretched arc crust (Pelletier et al., 1998). Progressing from north to south along the ELSC, depths decrease from ~3000 m to ~1700 m, the distance from the ridge to the arc decreases and the ridge becomes steep-sided (e.g., south of 21º27'S on portions termed the Valu Fa Ridge (VFR)) instead of flat, and the lavas become more arc-like (basalt to basaltic andesite to andesite with rhyo-dacite differentiates; Zellmer and Taylor, 2001; Jenner et al., 1987; Frenzel et al., 1990; Sunkel, 1990; Vallier et al., 1991; Hawkins, 1995; Pearce et al., 1995; van Calsteren et al., 1999). An axial magma chamber (AMC) reflector is imaged along the entire ELSC south of 20º30'S, deepening to the south to 3 km beneath the southern VFR (Harding et al., 2000). It has been proposed that differences in some of these key geological variables (e.g., source rock composition, depth to magma, proximity to the arc, crustal structure) may result in extremes in vent fluid and deposit compositions. In addition, the ELSC provides better compositional and process analogs for the formation of economically significant massive sulfide deposits relative to studies of hydrothermal processes along MORs, and thus will provide an important link between studies of active deposits on spreading centers and fossilized deposits on land, in particular those at ophiolites. From a biological perspective, investigation of hydrothermal systems within the Lau Basin will greatly increase the biogeographic range and diversity available for detailed study. Furthermore, due to the low pH and high concentrations of heavy metals that may be present in ELSC vent fluids (e.g., at Vai Lili; Fouquet et al., 1991; Douville et al., 1999), these studies may expand the known physiological diversity of microbes at deep-sea vents.

To address these issues, the focus of the TUIM05MV cruise was on simultaneous collection of vent fluid, solid, microbial, and megafaunal samples at each of six different vent sites, acknowledging the interdependence among vent deposits, the fluids from which they form, and vent-associated biological communities. The compositions of the solids are intimately related to both the styles of mixing between vent fluids and seawater, and to the presence and locations of microbes and megafauna within and at the surfaces of the deposits. The locations of microbes within the vent structures, and of organisms on the exteriors of the structures are in turn partly determined by existing environmental conditions, including compositions of local fluids, and compositions and grain sizes of minerals. The strategy was thus to carry out simultaneous

sampling of fluids, deposits, microbes, and megafauna, and to identify the spatial relationships among types of venting (e.g., diffuse, focused), types of vent structures and regional morphologies, rock composition and lava flow type, and megafauna.

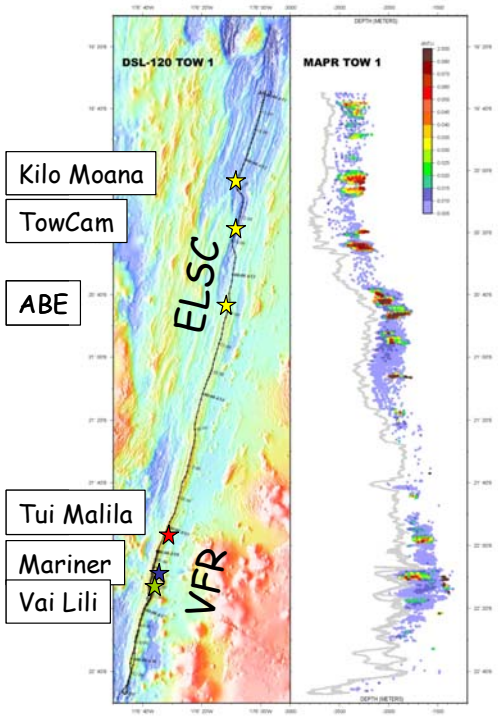
An important goal of this work was to provide critical information about ELSC vent sites to be used by the RIDGE 2000 community, in conjunction with data collected on other cruises, to identify the "bull's-eye" of the Lau ISS.

Cruise objectives:

Characterize for each of 6 vent fields:

- Distributions of types of venting, types of vent structures and morphologies, and their relations to substrate and the range and distribution of megafauna (Mapping using SM2000/Mosaics using down-looking pixelfly and forward-looking digicam)
- Fluid chemistry (e.g., range and variation of Cl, H_2S, H_2, CO_2, pH, Fe, Mn, and a suite of other aqueous species, some stable isotopic compositions, volatiles, and organics at each site)
- Vent deposit mineralogy and bulk geochemistry
- Molecular and physiological diversity of microbes associated with diffuse and high temperature fluids and active chimneys
- Range, abundance, distribution, and reproductive status of dominant megafaunal organisms present in vent fields and distribution of larvae/plankton in water column above vents

Vent Fields studied along the ELSC and VFR



E. Baker & J. Resing, pers. comm., 2004
From F. Martinez et al. Cruise, 2004

How discovered:

- ★ *Nautile* Dives from water column temperature anomaly data and dredged hydrothermal deposits. (Fouquet *et al.*, 1991)
- ★ Water column (MAPR, CTD), ABE and TowCam surveys. (Martinez *et al.* and Langmuir *et al.* cruises, 2004)
- ★ Water column surveys, ABE, TowCam, *Shinkai* 6500 Dives. (Martinez *et al.*, Langmuir *et al.* and Takai *et al.* cruises, 2004)
- ★ Multiple CTD Tow-Yo Casts using MAPR data. (Tivey *et al.* cruise, 2005)

Strategy:

1. Locate 5 known vent fields (using GPS location, transponder), and use CTD-N and chemical capabilities (Fe, Mn, pH, and H_2S) to pinpoint 1 additional vent field location.
2. Use Jason2 to map, sample, and characterize vent fields:
    a) SM2000 for detailed bathymetry of vent field (some already done by ABE)
    b) Video and still camera imagery to map locations and styles of venting (focused black or white smokers, diffuse flow, types of chimneys (beehives, columnar, etc.), abundance of inactive deposits, substrate freshness and type, and locations of megafauna) (some already done by ABE).
    c) Sampling for fluid/chimney pairs plus associated fauna, diffuse fluids and associated fauna and substrate, and inactive deposits and substrate.
3. After the ROV dives at a particular site, MOCNESS tows will be conducted above the site, and off-axis, to sample larvae of vent organisms and local plankton communities.

Table 1a. Days required for cruise activities.

Activity	Distance	Time
Steam from Tonga to 20º3'S	80 n. mi	0.5d
Transits between vent fields	~270 n. mi.	~1 d
Steam from 20º3'S to Tonga	80 n. mi.	0.5 d
Deploy and survey 9 transponders, 4 hr per*		1.5 d
Dive time – 4.5 days per large site x 3 sites		13.5 d
Dive time – 2.5 days per small site x 3 sites		7.5 d
MOCNESS –6 hrs per large site x 6 sites		1.5 d
CTD at each site for particles		1 d
Contingency and/or CTD Tow-yos		5 d
Total		32.0 d

*Transponder deployments: We plan 3 transponders per large site, 2 per small site. We are assuming that previous cruise(s) will have left a single transponder at most sites, so plan to deploy 2 more per large site, 1 more per small site, assuming ~4 hours per transponder to deploy, survey the net, and retrieve.

Table 1b. Total anticipated numbers of samples to be collected.

Sample types	per large site	per small site	Total**
Focused fluids	~ 9	~ 4	~ 39
Diffuse fluids*	~ 6	~ 2	~ 24
Active chimney*	4 to 5	2	~ 20
Inactive chimney	3	2	~ 15
Substrate	2	2	~ 12
Megafauna	9 to 16	4	~ 39-60
Larvae and plankton	~ 20	if time permits	~ 60

*Microbiological samples will be taken from active chimney and diffuse fluid samples
** Total is sum of samples from 3 large and 3 small sites

CRUISE TUIM05MV:

Location of Vent Fields-

Locations of 3 of the 6 vent fields were provided by the Ridge2000 investigators who participated in the first 2 cruises of the 5 cruise series: a cruise in April 2004 on the R/V Kilo Moana (F. Martinez, Chief Scientist), and a cruise in September 2004, also on the R/V Kilo Moana, using the Autonomous Benthic Explorer ABE and TowCam (C. Langmuir, Chief Scientist). These PIs provided known locations of vent fields and indications of additional sites from water column anomalies coupled to sidescan and high resolution bathymetry. The Tui Malila vent field was located during our cruise, using information from the Martinez et al. cruise. Information about activity at the Mariner and Vai Lili vent fields was kindly provided by the PIs of the September 2004 Shinkai 6500 dive program (K. Takai, Chief Scientist).

Kilo-Moana vent field: 20º3.15'S, 176º8.03'W – depth of vent field ~2620m.
TowCam vent field: 20º19'S, 176º8.2'W – depth of vent field ~2700m
ABE vent field: 20º45.67'S, 176º11.44'W; 20º45.8'S, 176º11.5'W; 20º45.97'S, 176º11.57'W; – depth of field ~2140m
Tui Malila: 21º59.35'S, 176º34.06'W – depth of field ~1870m
Mariner vent field: 22°10.82'S, 176°36.09'W – depth of vent field ~1910 m
Vai Lili vent field: 22 12'50-59"S, 176 36'30"W – depth of vent field ~1710-1740 m

Also, CTD tow-yos were carried out at Site 4 = 21º6.2'S (site 4 explored by Langmuir cruise)

Chronology of cruise activities -

- April 5, 2005: Leave port, 1600 local time, April 6, 2005, 0300z.
- April 6, 2005: 0501 local time, 1601z, on station checking transponders. "B" transponder not responding.
- April 6, 0733= April 5, 1833z: Transponder "C" deployed, 9.0/10.5, Release Code D, tether 152 m, 2432 m depth (2584m seafloor depth)
- **Jason2 Dive 124** to Kilo Moana Vent Field: April 5, 2142z to April 6, 1958z
- CTD Wire Test: 20 03.542S, 176 07.535W, April 6, 2039z to 2202z
- MOCNESS TOW Kilo Moana Vent Field, April 7, 0203z to 0516z
- **Jason2 Dive 125** to Kilo Moana Vent Field: April 7, 0704z to April 8, 0700?z
- CTD Kilo Moana, April 8, 0752z to 1018z
- MOCNESS TOW Kilo Moana, April 9, 1130z - 1655z
- **Jason2 Dive 126** to Tow Cam Vent Field: April 9, 2330z to April 10, 0712z
- MOCNESS TOW Kilo Moana Vent Site, April 10, 0942z - 2006z
- **Jason2 Dive 127** to Tow Cam Vent Field: April 10, 2322z to April 11, 1936z
- CTD Tow Cam: April 11, 2005z to April 11, 2233z
- MOCNESS Tow Cam April 12, 0055z to 1345z
- Transponder deployed at ABE site, April 12, 1907z, because A transponder would not respond
- **Jason2 Dive 128** to ABE Vent Field: April 12, 2136z to April 14, 0252z
- CTD ABE site: April 14, 0312z to 0530z
- **Jason2 Dive 129** to ABE Vent Field: April 14, 0702z to April 15, 0302z
- Transponders deployed at Mariner/Vai Lili sites, April 15, 1343z to 1419z

- **Jason2 Dive 130** to Mariner Vent Field: April 15, 1931z to April 16, z
- April 16 0515z to April 21, 2300z - Weather prevented diving with Jason2, and there was a problem with Jason's hydraulics.
- CTD Mariner, April 16, 0445z to 0736z
- CTD Vai Lili, April 16, 1611z-1753z
- J2 test 1– failed, April 17, 0109z-0202z
- MOCNESS Mariner, April 17, 0312z to 1110z
- Tow yo 1, 21 59, April 17, 1538z to 1903z
- J2 test 2 of hydraulics – failed – April 17, 2133z to 2330z
- Tow-yo 2, 21 59, April 18, 0055z to 1037z
- Lay transponders, 21 59, April 18, 1303z and 1340z
- Steam to Ata Island and back (no lee to deploy in – weather too rough)
- Tow yo 3, 21 59, April 18, 2359z to April 19, 0515z
- Tow-yo 4, 21 59, April 19, 0554z to 0933z
- Steam to Tongatapu
- J2 test 3 of hydraulics - failed, April 19, 2105z to 2209z
- J2 test 4 of hydraulics – passed!, April 20, 0502z to 0618z
- Steam to 21º6'S, weather still too rough to dive
- Tow-yo 1, 21º6'S, April 20, 1350z to 1936z
- Tow-yo 2, 21º6'S, April 20, 2024z to April 21, 0232z
- Tow-yo 3, 21º6'S, April 21, 0323z to 0855z
- Tow-yo 4, 21º6'S, April 21, 1005z to 1358z
- **Jason2 Dive 131** to Mariner Vent Field: April 21, 2326z to April 23, 0100z (with brief intermission, April 22, 0900z to 1157z)
- MOCNESS Vai Lili, April 23, 0220z to 0958z
- Jason2 line break while launching at Vai Lili – April 23, 1117z to 1203z; had ship stand down until morning.
- CTD 21 59S, April 23, 1923z to 2110z
- **Jason2 Dive 132** to Tui Malila Vent Field: April 24, 0120z to April 25, 0309z
- CTD 21 59S, April 25, 0344z to 0533z
- CTD Mariner, April 25, 0706z to 0844z
- **Jason2 Dive 133** to Vai Lili Vent Field: April 25, 1110z to April 26, 0002z
- April 26, 0000 to April 27, 0500 - Weather prevented diving with Jason2
- MOCNESS Tui Malila, April 26, 0213z to 0940z
- CTD at Tui Malila, April 26, 1508z to 2131z
- CTD at Tui Malila, April 26, 2206z to April 27, 0400z
- **Jason2 Dive 134** to Tui Malila Vent Field: April 27, 0505z to April 28, 1218z
- **Jason2 Dive 135** to Mariner and Vai Lili Vent Fields: April 28, 2015z to April 29, 1040z
- Recovered transponders from Mariner/Vai Lili, April 29, 1140z and 1230z
- CTD at Tui Malila – confirmed lack of activity north of mapped area, April 29, 2021z to 2355z
- Recovered transponders at 21º6'S, April 30, 0629z and 0713z
- April 30, 0900z to May 1, 1900z - Weather prevented diving with Jason2 or doing CTD or MOCNESS tows
- CTD Tow Cam Vent Field, May 1, 1904z to 2122z

- **Jason2 Dive 136** to ABE Vent Field: May 2, 0302z to May 3, 0023z
- Weather prevented going up to Kilo Moana for dive
- MOCNESS ABE, May 3, 0125z to 1135z
- CTD at Kilo Moana, May 3, 1644z to 1847z
- **Jason2 Dive 137** to Kilo Moana Vent Field: May 3, 1931z to May 4, 0712z
- 10.5 hour transit to Tui Malila
- **Jason2 Dive 138** to Tui Malila Vent Field: May 4, 1912z to May 5, 0727z
- Recovered transponders at 21º59'S, May 5, 0933z and 1022z
- **Jason2 Dive 139** to Tow Cam Vent Field: May 5, 2005z to May 6, 0741z
- May 6, arrive Tonga

Table 2: Cruise TUIM05MV - Schedule

		April 5 1600 – Lv Tonga	6 Start J2-124 at Kilo Moana Field	7 End J2-124 CTD test MOCNESS Start J2-125 KM	8 End J2-125 CTD - KM MOCNESS	9 Try Xpndr recovery Start J2-126 at Tow Cam
10 End J2-126 MOCNESS at K-M	11 Start J2-127 TC	12 End J2-127 CTD – TC MOCNESS at TC	13 Start J2-128 ABE Field	14 End J2-128 CTD at ABE StartJ2-129	15 ABE End J2-129 Try Xpndr recovery To Mariner	16Deploy Xpndrs St J2-130 Mariner End J2-130 CTD M
17 CTD Vai Lili J2 test 1 MOCNESS Mariner	18 Tow yo 1 Tui Malila J2 test 2 Tow yo 2 Tui Malila	19 Lay Xpndrs TM To Ata and back Tow-yo 3,4 Tui Malila	20 To Tonga J2 test 3,4 To 21º6'S	21 Tow yo 1 thru 4, 21º6'S	22 To Mariner St J2-131 Mariner	23 End J2-131 MOCNESS Vai Lili
24 J2-132 Vai Lili Line break CTD TM St J2-132 Tui Malila	25 End J2-132 CTD TM CTD Mariner	26 J2-133 Vai Lili - end early due to weather MOCNESS TM	27 CTD TM CTD TM St J2-134 Tui Malila	28 End J2-134, Tui Malila	29 J2-135 Mariner/Vai Lili	30 Recover Xpndrs, M/V CTD TM recover Xpndrs 21º6'S
May 1 weathered out of all	2 CTD TC J2-136 ABE	3 End J2-136 MOCNESS ABE	4 CTD KM St J2-137 KM End J2-137	5 Transit to TM J2-138 Recover Xpndrs TM	6 St J2-139 Tow Cam End J2-139	7 0600 – Lv Tow Cam for Tonga Ar 1500

Cruise results for each vent field:

Kilo Moana Vent Field

CTD

CTD Wire Test: 20 03.542S, 176 07.535W, April 6, 2039z to 2202z

Concerns about extent of rust on CTD wire, so ran wire out to 2203 m – looked good after about 1000 m so should be no problem with it.

CTD wire test began at 4/6/05 at 2039z, to 2203 m at 2113z, back on deck at 2202z

CTD at 20 03.1947'S, 176 08.0200'W, April 8, 0752z to 1018z

In water at 0752z, 20 03.197'S, 176 8.027'W
Cast at bottom at 0850z, 20 03.201'S, 176 8.024'W, 2611m, 42.36 m above bottom
Recovered at 1018z, 20 03.201'S, 176 8.025'W

CTD at Kilo Moana, May 3, 1644z to 1847z

MOCNESS

MOCNESS over Kilo Moana Vent Site, April 7, 0203z to 0516z

MOCNESS over Kilo Moana Vent Site, April 9, 1130z - 1655z

MOCNESS over Kilo Moana Vent Site, April 10, 0942z - 2006z

Jason2 dives

Jason2 Dive 124 to Kilo Moana Vent Field: April 5, 2142z to April 6, 1958z

Dive Summary:

2047z, at launch position, 20 2.943'S, 176 8.537'W
2142z: Jason2 launched
2353z: On bottom

Landed northwest of the vent field and drove east to the first target (hydrothermal activity identified by ABE). Proceeded with engineering tasks: tested pixelfly, bottom following, 300 kHz Doppler, ICL, SM2000, temperature probe, slurp (only the latter did not work). Did all of this while exploring the northernmost area of Eh, optical backscatter, and temperature "hits" noted during ABE dive 141. Did not find active venting. Then started to head south to find a good place for pilot practice with manipulators, and found active venting from smokers (at x6920, y10781) at the southern edge of the ABE 141 identified area. Navigation excellent during entire dive! Continued south and found tall (20 m high) active chimney area at x6937, y10730 (the middle area identified from ABE 141 "hits'). Continued south and found another

area of vent activity in the south, x6941, y10632, corresponding to the southern area identified by ABE 141 "hits." Sampled this southern area, then did an SM2000/pixelfly survey of the southern area. Then completed sampling in the southern area. Recovered vehicle after all sample boxes and water bottles were filled and two markers were set out.
1745z: Off bottom
1958z: On deck

Table 3. Samples collected, J2-124.

Sample types	
Focused fluids	4 (2IGT, 2M, 1 vent)
Diffuse fluids*	0
Active chimney*	3 (1 w/fluid pr J2-125)
Inactive chimney	1
Substrate	1
Megafauna	2 (mussels, barnacles)
SM2000/pixelfly (~40m^2)	Southern area

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 125 to Kilo Moana Vent Field: April 7, 0704z to April 8, 0716z

Dive Summary:

0704z: Jason2 launched, 20 03.02'S, 176 08.44'W
0839z: On bottom

NOTE: During dive did some benchmarks. Faced edifice and marker, noted distance and heading to marker, and recorded a good x,y,z fix. Will be used by other cruises to match grids.

Landed northwest of northern field at x6872, y10795, z2625m and transited to smokers of northern field, checking and adjusting exposure of pixelfly. Did some reconnaissance to provide background information on heights and numbers of smokers and locations of venting. Did SM2000/pixelfly of northern vent area, coming up and over smokers as did survey (later determined to be a bad idea for SM2000 data – preferred to go around structures and then come back and image structures as pass high and to one side of them). Then did SM2000/pixelfly of mid area. Sampled mid area for high temperature fluid, solid, biota, and then went to northern area and did the same, including a vertical mosaic at Marker 6. Then went to mid area and did a vertical mosaic and did some additional sampling. Went on to southern area and sampled fluid. Ended dive after completing a number of SM2000/pixelfly lines to fill in gaps in data collected on J2-124.
0528z: Off bottom
0716z: On deck

Table 4. Samples collected, J-125.

Sample types	
Focused fluids	4 IGT (6IGT, but 2 leaked, 3 vents)
Diffuse fluids*	0
Active chimney*	2 (1 w/fluid pr, only 1 for microbio)
Inactive chimney	3
Substrate	1
Megafauna	6 (mussels, barnacles, crab, sponge, snails, anemones)
SM2000/pixelfly (~40m^2)	northern and mid areas

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 137 to Kilo Moana Vent Field: May 3, 1931z to May 4, 0712z

1931z: Jason2 launched,
2121z: On bottom

Dive summary: Diving with only one transponder working, so went to known site at Marker 6 and reset Doppler to cursor and used DVL nav. Found a good smoker to sample about 10 m from Marker 6, and took a sulfide/fluid sample pair (T=325C). Surveyed and noted ~ 6 black smoker vents in this northern area. Then went to the central area, noting an 8 m wide fissure trending 186. In central area sampled fluid at x6928, y10733 (T=299C) and took sulfide pair. Collected some organisms – brisingid stars on pillow lava, and some anemones, and did some pixelfly lines, and then sampled diffuse flow at x6934, y10725. Then did a full pixelfly survey over the area of diffuse flow. Then flew an SM2000 line to fill the gap between the central and southern areas, only to find that the nav was off by about 25m N-S. Went to Marker 1 in the southern area and reset the nav. Sampled fluid near Marker 1 (330C) and then reflew SM 2000 line to make sure gap was filled. Came south to Marker 5 and noted that nav was still good. Sampled a white spire, slurped some shrimp and a few scale worms, and ended the dive.
0539z off bottom
0712z on deck

Table 5. Samples collected at Kilo Moana.

Sample types	Samples collected on J2-137	**Total for site**
Focused fluids	5 (3 vents)	13 (7 vents)
Diffuse fluids*	1 (1 vent)	1 (1 vent)
Active chimney*	5 (3 w/fluid)	10 (5 paired to fluid, 3 for microbiology)
Inactive chimney	0	4
Substrate	3	5
Megafauna	4	12
SM2000/pixelfly (~40m^2)		3 areas

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Tow Cam Vent Field

CTD

CTD over Tow Cam, April 11, 2005z to April 11, 2233z

CTD over Tow Cam, May 1, 1904z to 2122z

MOCNESS

MOCNESS over Tow Cam April 12, 0055z to 1345z

Jason2 dives

Jason2 Dive 126 to Tow Cam Vent Field: April 9, 2330z to April 10, 0712z

NOTE: During dive did some benchmarks. Faced edifice and marker, noted distance and heading to marker, and recorded a good x,y,z fix. Will be used by other cruises to match grids.
2330z: Jason2 launched,
0127z: On bottom

Found indications of venting in northern part of field (see maps) within ten minutes of reaching bottom. Placed Marker 7 (later replaced with Marker 9) and explored northern area to get an idea of vent structure heights, extent of venting, etc. (Jason not receiving from either transponder. Medea receiving fine and has good navigation using LBL. Using Medea's LBL, positioning Jason under Medea and then using DVL, resetting when lose bottom lock. The lack of good navigation similar to what we had at the Kilo Moana site cost us time and was frustrating, but were able to work around it). Did high altitude (~18 m off bottom) survey of entire site (see map of tracklines). Then did lower altitude pixelfly/SM2000 survey of northern area. Ended surveys at 1116z (~10 hours after reaching bottom). Sampled northern vent area for fluid, rocks, and biota. Then did high altitude SM2000 lines along edge of scarp down to southern area, and did low altitude SM2000/pixelfly survey of southern area. Placed markers at sites of diffuse flow and diffuse+high temp flow. Surveying at end of dive took ~4 hours.
0528z: Off bottom
0712z: On deck

Table 6. Samples collected on J2-126.

Sample types	
Focused fluids	4 (3 vents)
Diffuse fluids*	2 (1 vent)
Active chimney*	2 (2 w/fluid pr)
Inactive chimney	3
Substrate	4
Megafauna	7 (brittle stars, anemones, tubeworms, Alviniconcha snails, barnacles, gastropods)
SM2000/pixelfly (>40m^2)	Northern and Southern areas + high altitude larger SM2000 survey

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 127 to Tow Cam Vent Field: April 10, 2322z to April 11, 1936z

NOTE: During dive did some benchmarks. Faced edifice and marker, noted distance and heading to marker, and recorded a good x,y,z fix. Will be used by other cruises to match grids.
2322z: Jason2 launched,
0109z: On bottom

At bottom at 0108z, over pillow basalt. Transited to Marker 11 in the southern area, where Jason circumvented the venting area that is ~8 x 10 meters in area, made up of coalesced small spires: some venting higher temperature fluid from very small openings (highest measured temperature 58C, but could not put probe all of the way into the opening) and percolating through sides of structures. Many white diffusing spires and only a few focused flow openings. Looked for a good site of diffuse or focused flow to sample with no luck. Went on to Marker 12 site where Jason2 sampled fluid at a 288C orifice, collected a white active spire (temperature at post sampling surface that was venting was 63C), and a piece of vent structure wall that fell during sampling. Then headed north to examine the "bumps" observed in the SM2000 map north of the venting area, which were piles of basalt rubble/collapsed pillows. Then transited east and north to northern area of venting, passing patches of abundant diffuse flow and lush biological communities within collapse pits around the periphery of the central volcanic dome (observed in the SM2000 bathymetry). In the northern area, the major bottle samples were taken at Marker 7 (T=307C), and mussels were also sampled, and then we took a careful look at the diffuse flow area located about 10 meters east of Marker 7, where abundant diffuse flow supports lush communities of gastropods, anemones, mussels, crabs, barnacles, limpets, and shrimp; no sulfide structures are present. Transited south on different trackline to Marker 11, where a smoking spire was successfully sampled, opening an orifice large enough to take two fluid samples (T=287C). An active white spire, venting 182C fluid after sampling, was collected, and observations and collections of organisms were made. The final part of the dive was spent searching for a spire observed earlier when Jason was pulled off of the Marker 11 site (with no success), and transiting back up to the northern vent area to Marker 9 and beyond, where walls of microbial mat were observed at x6607, y5540. Evidence for activity north of target 22 (x6610, y5552, 2209m, hdg113) was noted as the dive ended.
1747z off bottom
1936z on deck

Table 7. Samples collected on J2-127.

Sample types	
Focused fluids	4 IGT, 2M (2 new vents, 1 same as J2-126)
Diffuse fluids*	0
Active chimney*	4 (1 w/fluid pr, 4 for microbio)
Inactive chimney	1
Substrate	1
Megafauna	6
SM2000/pixelfly (~40m^2)	

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 139 to Tow Cam Vent Field: May 5, 2005z to May 6, 0741z

2005z: Jason2 launched,
2156z: On bottom

Dive summary: Landed on bottom, identified Marker 11, and went to Marker 12. Multiple issues arose with Jason2 – ballast (ROV was too light), starboard manipulator would not work and was stowed (with difficulty), and hydraulic issues continued when using the port manipulator. Recovered an active spire from the Marker 12 site into the basket (could not get it into the biobox given arm difficulties). Without the starboard arm, it was not possible to use the major bottles. Did a "toaster" at Marker 12, and moved on to Marker 11, where another "toaster was done. Decision was made not to use the manipulator if it continued to cause more seawater to be drawn into the system. Carried out pixelfly transects near Marker 11, and then another over a diffuse area at ~x6631, y5438. Then went north into northern area and took an active spire, two IGT fluid samples (arm was working better) at x6637, y5549. Did a vertical mosaic of this structure, and then went to Marker 9 to leave a "do not disturb" stop-sign marker at the tubeworm site (x6614, y5537). Recovered an anemone sample before leaving the bottom.

0615z off bottom
0741z on deck

Table 8. Samples collected on J2-139.

Sample types		**Total for field**
Focused fluids	2 (1 vent)	12 (6 vents)
Diffuse fluids*	0	2 (1 vent)
Active chimney*	3 (1 w/fluid(?))	9 (4 paired w/fluid, 7 for microbiology
Inactive chimney	0	4
Substrate	0	5
Megafauna	1	14
SM2000/pixelfly (~40m^2)		2 areas

*Microbiological samples will be taken from active chimney and diffuse fluid samples

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ABE Vent Field

Transponder deployed at ABE site, April 12, 1907z, because A transponder would not respond

CTD
CTD over ABE site, April 14, 0312z to 0530z
MOCNESS
MOCNESS ABE, May 3, 0125z to 1135z

Jason2 dives
Jason2 Dive 128 to ABE Vent Field: April 12, 2136z to April 14, 0252z

2136z: Jason2 launched,
2308z: On bottom

NOTE: During dive did some benchmarks. Faced edifice and marker, noted distance and heading to marker, and recorded a good x,y,z fix. Will be used by other cruises to match grids.

Dive summary: On bottom at 2309z, found areas of active venting, and proceeded to carry out a high altitude (18m off bottom) SM2000 survey of the northern and mid areas of the vent field (from 2339z to 0315z). Then did a low altitude SM2000/pixelfly survey of the mid area from 0337zto 0521z, and transited to the NNE part of the northern area. Because this area is dominated by tall active spires, the ROV was used to outline the periphery of the active spires, marking them with navigation targets, instead of carrying out a low altitude pixelfly survey. Three mini pixelfly surveys were done in areas of interest: over a diffuse flow area on the edge of the western wall, over andesitic flow that shows linear distributions of empty mussel shells, and over a predator area. Sampling was then carried out in the northern area, recovering a piece of active flange (max T 148C), a high temperature fluid/sample pair (max T 326C, outer T 20C), diffuse fluid, shrimp, mussels, carb, galatheids, barnacles, anemones, and snails. Some vertical mosaics were done as well. The mid area was samples next, after circumventing the single major central active mound in that area. An active spire was sampled. Observations were made of a less active mound nearby before heading south to carry out the high altitude SM2000 survey of the southern area. A low altitude pixelfly survey was then done of the eastern part of the southern field before ending the dive at 0200z.
0124z off bottom
0252z on deck

Table 9. Samples collected, J2-128.

Sample types	
Focused fluids	4 (2IGT, 2M, 2 vents)
Diffuse fluids*	2 (2IGT, 1 vent)
Active chimney*	5 (1 w/fluid pr)
Inactive chimney	2
Substrate	5
Megafauna	8
SM2000/pixelfly (~40m^2)	High level SM2000 northern and mid areas, low level mid area

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 129 to ABE Vent Field: April 14, 0702z to April 15, 0302z

0702z: Jason2 launched,
0846z: On bottom

NOTE: During dive did some benchmarks. Faced edifice and marker, noted distance and heading to marker, and recorded a good x,y,z fix. Will be used by other cruises to match grids.

Dive summary: Began the dive on the western side of the southern area of the ABE vent field, and determined that the structures were too large and numerous to carry out the rest of the pixelfly survey in the south. Noted some good active structures and good locations for sampling and did a vertical mosaic. Took paired fluid/solid samples at a black/gray smoker (T~260C; Marker 20) and took a piece of the substrate and part of an old spire. Then did some temperature surveys in animal communities, sampled crabs, and did some pixelfly transects over specific locations. Then went north to mid area of ABE field and sampled a white spire and took fluid from a nearby orifice with T~288C at Marker 16 structure. Then did some single pixelfly lines over the Marker 16 structure, and moved on to look at diffuse flow area on the western wall where 2 diffuse fluid samples were taken, one within a patch of Ifremeria (T~17C) and one in a discrete patch of Alvinachoncha (T up to 99C beneath snails) – left Marker 21. Then noted a nearby high temperature orifice at Marker 17 that could be sampled on a later dive. Then ran some high altitude SM2000 lines to the west of previous ones between the mid and southern areas of the vent field to document locations of structures at the side and top of the western wall. Finished dive after heading back north to the Marker 21 diffuse flow site and collecting some pixelfly images of this area.
0139z off bottom
0302z on deck

Table 10. Samples collected on J2-129 at ABE Vent Field.

Sample types	
Focused fluids	4 IGT (2 vents)
Diffuse fluids*	2 IGT (2 vents)
Active chimney*	2 (2 w/fluid pr, 2 for microbio)
Inactive chimney	1
Substrate	2
Megafauna	1
SM2000/pixelfly (~40m^2)	

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 136 to ABE Vent Field: May 2, 0302z to May 3, 0023z

0302z: Jason2 launched,
0410z: On bottom
Dive summary: Landed at x7770, y7749 and transited to Marker 21 to deploy 3 spawning traps over the diffuse flow area, and left marker A, a stop sign indicating that the site should not be disturbed. Then went north to sample high temperature flow. At x7760, y7815 sampled a fluid/sulfide pair(?) (T=305C). Took just one sample. (While opening biobox, arm's wrist rotated, spooling and severing the cable to IGT-3). Then went to x7800, y7846 and ran an SM2000 line up on the wall to the west of the northern part of the vent field. Then went east to Marker 19 and took a major fluid sample. Then ran an SM2000 line south to the area not yet explored, and carried out an SM2000 survey. Came down to bottom to look for hydrothermal activity, but only found some shimmering water, and minimal organisms. Did see abundant __,

which were sampled. Went back north to southern area an sampled fluid at x y and a white spire, and scooped sediment from the base of the mound. Completed more SM2000 lines, and then went to x7643, y7399 to collect a piece of inactive sulfide. Then came up off bottom and transited 2400 m at 229 to the position of the dead transponder. Searched at 20 47.020'S, 176 10.657'W from depths of 2043m to 1993m and found nothing, so stowed gear and ended the dive.
2305z off bottom
0023z on deck

Table 11. Samples collected on J2-136 at ABE Vent Field.

Sample types		**Total for field**
Focused fluids	4 (3 vents (1 same as 126))	12, 6 vents
Diffuse fluids*	0	4, 3 vents
Active chimney*	1 (w/fluid)	8 (4 w/fluid; 7 micro?)
Inactive chimney	2 + scoop	5 + scoop
Substrate	1	8
Megafauna	1	10
SM2000/pixelfly (~40m^2)		High level SM2000 northern and mid areas, low level mid area

*Microbiological samples will be taken from active chimney and diffuse fluid samples

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Site 4, 21º6'S (see Appendix 2 for more information)

Tow-yo 1, 21º6S, April 20, 1350z to 1936z

Tow-yo 2, 21º6S, April 20, 2024z to April 21, 0232z

Tow-yo 3, 21º6S, April 21, 0323z to 0855z

Tow-yo 4, 21º6S, April 21, 1005z to 1358z

April 30, 0629z and 0713z - Recovered transponders at 21º6'S

Tui Malila Vent Field, 21º59'S on the Valu Fa Ridge

The location of the Tui Malila Vent Field was determined from CTD tows, and active venting discovered within 85 minutes of reaching the seafloor on Jason2 dive J2-132. An area 160m x 320m was mapped using SM2000, followed by near bottom observations and sampling. In the northern part of the field there is an area of diffuse flow with abundant organisms. The southwestern 150m (S to N) x ~80m (W to E) area is actively venting, with multiple structures of coalesced spires and, in some areas, flanges.

CTD
Tow yo 1, 21 59, April 17, 1538z to 1903z

Tow-yo 2, 21 59, April 18, 0055z to 1037z

Lay transponders, 21 59, April 18, 1303z and 1340z

Tow yo 3, 21 59, April 18, 2359z to April 19, 0515z

Tow-yo 4, 21 59, April 19, 0554z to 0933z

CTD 21 59S, April 23, 1923z to 2110z

CTD 21 59S, April 25, 0344z to 0533z

CTD at Tui Malila, April 26, 1508z to 2131z

CTD at Tui Malila, April 29, 2021z – 2355z - confirmed lack of activity north of mapped area

CTD at Tui Malila, April 26, 2206z to April 27, 0400z

MOCNESS
MOCNESS Tui Malila, April 26, 0213z to 0940z

Jason2 dives
Jason2 Dive 132 to Tui Malila Vent Field: April 24, 0120z to April 25, 0309z

0120z: Jason2 launched,
0226z: On bottom

Dive summary: Landed on sedimented basement and began transit to the x,y location noted as a buoyant plume location from transponder navigated CTD tow-yo. Began a grid search pattern to look for evidence of hydrothermal activity, as no large vent structures were noted in the imogenex, or could be seen by Medea. At 0334z noted the presence of lollipop organisms on the substrate in the pixelfly images. At 0347z saw a vent fish. At 0351z found mussels and an area of diffuse flow. Did a spiral search out from this area and mapped the extent of the diffuse area, but found no smokers. Went south until out of any evidence of hydrothermal activity. As searched saw a white horizontal layer in the distance – an active flange. Continued to explore down the slope, and found extinct hydrothermal structures. Followed these and found active spires. Began more systematic search of chimneys to the south. Continued to find active structures to the south and the west. Stopped to take fluid sample/solid pair (276C). Left Marker 14. Continued south and found a hotter smoker to sample (312C). Then came up to 25m to do SM2000 survey, noting structures and smoke as survey was done. Ended survey and headed to the diffuse flow area to sample organisms. Placed Marker 24. Took a single fluid sample (31C) and did a pixelfly survey. Transited to "mothership" flange and took a fluid sample/flange pair (175C, 13.8C on top) and left Marker 25. Then moved west and sampled an active spire, and

set-up to continue the SM2000 survey at 30 m off bottom, again noting presence of structures. Came down to examine area south-southwest of diffuse area and mothership. Investigated ridegs (andesite) and then found unusual talus on ridge to south, and took a sample, came to the top of that ridge and sampled andesite. Continued and came to active spires and sampled one (246C inside, ambient on exterior). Then did a vertical mosaic, and attempted to fly some pixelfly lines. Went to other active structures in southwest of vent field and sampled 260C fluid and took a chimney pair and a sample from the base pf the same chimney structure. Then went to microbial mat site and slurped mat, shrimp and scale worms (x1516, y2893, 1862m, hdg256). Transited to southeast corner of vent field to pillows and ended the dive.
0150z off bottom
0309z on deck

Table 12. Samples collected on J2-132 from Tui Malila.

Sample types	
Focused fluids	4 IGT (4 vents)
Diffuse fluids*	1 IGT (1 vent)
Active chimney*	6 (3 w/fluid pr, 3 for microbio)
Inactive chimney	4
Substrate	4
Megafauna	6
SM2000/pixelfly (~40m^2)	SM2000 surveys at 25m to look for vent structures/hydrothermal activity (smoke)

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 134 to Tui Malila Vent Field: April 27, 0505z to April 28, 1218z

0505z: Jason2 launched,
0609z: On bottom

Dive summary: Landed west of the field and did 2 SM2000 lines, 1 south, then 1 west to the pillow area that was found at the end of J2-132. Sampled pillows and transited to the 312C vent site, noting contacts between pillows and more sedimented hackly flow. Took fluid at the 312C vent (but was only ~285C) and took a piece of old sulfide talus ~5 m north of the 312C vent. Then transited to the mothership flange and took a fluid sample (that leaked so was no good), and then did a detailed pixelfly survey of the diffuse flow area and scooped some sediment. Then did more lines for the SM2000 map, looking for activity to the north. At the northernmost point, came down so could see the bottom and surveyed, then crossed west and came up to 22 m above bottom and did an SM2000 survey, looking for structures or particles. Then transited near bottom back to area of particles but found no activity. Flew 20 meters above bottom to southern end of northern area and came east and found evidence of a structure. Came down and found two areas of hydrothermal venting. Explored and sampled these, leaving markers 22 and 23 and doing some pixelfly lines. Explored north, finding the northern extent of venting, and then returned to take fluid, chimney, and flange samples, leaving Markers 27 and 26, and collecting some anemones on andesite(?) before ending the dive. As the vehicle left bottom, noted the northern extent of venting from flanges at x1575, y3229.

1037z off bottom
1218z on deck

Table 13. Samples collected on J2-134 from Tui Malila.

Sample types	
Focused fluids	6 IGT (1 failed; 4 vents, 2 same as 132)
Diffuse fluids*	0
Active chimney*	3 (1 w/fluid pr)
Inactive chimney	3 + sed scoop
Substrate	3
Megafauna	1 (anemones)
SM2000/pixelfly (~40m^2)	25m off bottom to do SM2000 survey, noting structures and smoke as survey

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 138 to Tui Malila Vent Field: May 4, 1912z to May 5, 0727z

1912z: Jason2 launched,
2102z: On bottom

Dive summary: Landed northwest of vent field and transited to Marker 26 and reset nav. Explored the northern boundary of the Vent Field, finding empty mussel shells as far north as y3236, and diffuse flow from the base of the wall at y3241. Went north along wall and found no additional activity. Went east and came south over pillow lava. Came back into areas of venting at y3225. Took two fluid samples (229C), and measured the temperature within a cluster of snails (17C), and sampled a piece of inactive chimney. Then explored along the western wall – excellent exposure of dikes. Took a sample, and also a sample of old flange that had grown out from the wall. Then did a small vertical mosaic. Transited south along the wall using the CTD temperature anomaly map to try to locate additional sites of venting with no luck. Went to the mothership flange and sampled rubble from its base, and then went north to the diffuse flow site, where diffuse fluid was sampled (~24C), and stop sign marker B was deployed. Then did a survey west and south to find the limit of the southwestern venting area, which was at x1538, y3000. Sampled an active spire/flange assemblage at , and then took a fluid sample at a nearby chimney at x1524, y2986 (~270C). Then went east to sample more of the hydrothermal breccia, and went upslope to the south attempting to find its source. Followed a trail of talus, Fe-oxide, and empty shells. Came up slope to a venting structure at x1525, y2915. Did a vertical mosaic of the structure, scooped some sediment from below and north of the structure, and then attempted to take a fluid sample, but the nozzle jumped out after opening so collected mostly seawater. Then followed the ridge to the southeast, coming to a highly altered mound where we took a sample, imaged a structure that looked like an andesite plug with some diffuse venting, flanges, and bacterial mat, and ended the dive.
0609z off bottom
0727z on deck

Table 14. Samples collected on J2-134 from Tui Malila.

Sample types		Total for field
Focused fluids	4 (2 vents)	13 IGT (8 vents)
Diffuse fluids*	1 (1 vent)	2 IGT (2 vents)
Active chimney*	1 (w/fluid pr)	10 (5 w/fluid pr)
Inactive chimney	5 + scoop	12 + 2 scoop
Substrate	1	8
Megafauna	0	7
SM2000/pixelfly (~40m^2)	surveyed west and south to find limit of SW venting area; vertical mosaics	Nearly complete SM2000 bathy map

*Microbiological samples will be taken from active chimney and diffuse fluid samples

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Mariner/Vai Lili Vent Fields

CTD

CTD Mariner, April 16, 0445z to 0736z

CTD Mariner, April 25, 0706z to 0844z

CTD Vai Lili, April 16, 1611z-1753z

MOCNESS

MOCNESS Mariner, April 17, 0312z to 1110z

MOCNESS Vai Lili, April 23, 0220z to 0958z

Jason2 dives

Jason2 Dive 130 to Mariner Vent Field: April 15, 1931z to April 16, z

1931z: Jason2 launched,
2120z: On bottom

NOTE: During dive did some benchmarks. Faced edifice and marker, noted distance and heading to marker, and recorded a good x,y,z fix. Will be used by other cruises to match grids.

Dive summary: Within 7 minutes of reaching the bottom and moving south (using navigation form the Shinkai dives carried out last September, 2004), we found a 10 meter tall inactive structure, and to the east multiple taller narrow structures that were active at the base. The structures are tree-like, rising to 27 m above bottom, ranging in diameter from 3 to 5 meters. These structures exhibit extremely limited megafauna – only a few crabs and shrimp were observed - though in areas the structures are coated with a bacterial layer (appears as a gauze or fuzzy film). In general the active smokers are located at the base of the structures, and in the northern part of the field it is difficult to work owing to the height of the structures and the tether. Jason fly high and dropped to the base of some shorter spires in the southern part of the vent field to attempt to sample black smokers. No markers were found from the Japanese expedition,

but a 331C smoker was found and paired chimney/fluid samples were taken. After the samples were taken, a leak was noted in the hydraulic system. Before recovering Jason, several high altitude (25 mab) SM2000 lines were flown to document the locations of tall structures in the center part of the field, from 0043z to 0147 when Jason left the bottom.

Dive ended early because of problem with hydraulics, but were due to come off bottom by 0430 because of weather.
0146z off bottom
0314z on deck

Table 15. Samples collected on J2-130.

Sample types	
Focused fluids	2 IGT, 2M (1 vent)
Diffuse fluids*	0
Active chimney*	2 (1 w/fluid pr, 1 for microbio)
Inactive chimney	0
Substrate	0
Megafauna	0
SM2000/pixelfly (~40m^2)	25 m alt survey over center part of vent field

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 131 to Mariner Vent Field: April 21, 2326z to April 23, 0100z (with brief intermission, April 22, 0900z to 1157z)

1931z: Jason2 launched,
2120z: On bottom
Dive summary: Landed at x4970, y5960 over sedimented basement and collected SM2000 data as transited to SM2000 survey start point. Carried out SM2000 survey of western side of vent field, noting positions of structures and smoke. Then came low to look for Japanese markers 95 and 96, with no luck. Found microbial mat at x4913, y5744, then went NE and then S to x4972, y5757 where fluids were taken (T=270 to 295ºC). Also sampled an active chimney. Attempts at taking a piece of old sulfide failed – structure is too soft and disintegrates. Continued to survey in southern area, noting "lollipop" like organisms on old rock surfaces. Again, attempts at sampling failed because samples disintegrate, creating orange flocculates. Surveyed southwestern area until arrived at the spot where fluids were sampled on the previous dive. Then Jason2 lost power, began recovery to 900m off bottom, where Jason's power returned after unplugging and replugging in wires at the winch. Jason returned to the seafloor 3 hours later in a slightly northern location, and fortuitously adjacent to Japanese Marker 94 (at x5011, y5864, 1917m, hdg 237)! Using information from the Japanese cruise report, found their Marker 93 and sampled fluid, collected shrimp, and noted the presence of a few mussels. Moved on, noting limited biota, presence of "lollipops," and scooped a sample of old chimney structure with lollipops. Carried out a short pixelfly line and then did a search for diffuse flow. Sampled diffuse flow and associated mat and solid at x5071, y5885 (termed "benchtop"). Headed further north and examined the "crater" and sampled exposed andesite(?) basement at x5036, y5924. Moved south, picked up piece of andesite(?) with lollipops on it, and then did a vertical mosaic of a tall structure at x5042, y5904. Then went east to do the eastern part of the SM2000 survey,

and then cut across the northern part of the area. Came south to sample the tall (27m high) structure. Found JM94 and skirted north of the structures. Sampled an active beehive spire at the base of the structure (x4980, y5865, 1910m, hdg188) and then came up side of structure and sampled a relict spire at 1904 m depth (x4983, y5859). Then carried out to pixelfly lines before ending the dive.
2332z off bottom
0100z on deck

Table 16. Samples collected on J2-131.

Sample types	
Focused fluids	4 IGT (2 vents)
Diffuse fluids*	2 (1 vent)
Active chimney*	3 (1 w/fluid pr)
Inactive chimney	2
Substrate	2
Megafauna	2 (Lollipops, shrimp) + mat
SM2000/pixelfly	22m alt surveys plus pixelfly of seafloor

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 133 to Vai Lili Vent Field: April 25, 1110z to April 26, 0002z

1110z: Jason2 launched,
1218z: On bottom
Dive summary: Carried out SM2000 survey at 20 meters above bottom, noting presence of structures, then dropped down to look for diffuse flow (using maps from Japanese September 2004 cruise). Slurped bacterial mat and took fluid samples (31 to 36C), and then continued SM2000 survey. Did some pixelfly near Japanese Marker 89. Then continued SM2000 survey. Then came down to survey. Looked at crater at southeast end of the field (floored by andesite(?) and heavily sedimented, with some staining and bacterial mat. Went west then north along western ridge – primarily andesite. Took some samples for groundtruth, and continued north, crossed ridge into gap between west and east ridges and found an active flange venting 120C fluid. Saw 6 snails, 4 shrimp, 2 crabs, 2 scale worms. Took fluid samples and a pired flange sample. Told to come up in 30 minutes, so wandered north, coming upon Japanese Marker 00 only ~10 meters from the flange. Found no organisms, knocked over the Fe-oxide chimney top to the active vet, and sampled 70C fluid before ending the dive.
2258z off bottom - had to surface early because of weather.
0002z on deck

Table 17. Samples collected on J2-133 from Vai Lili.

Sample types	
Focused fluids	4 IGT (2 vents)
Diffuse fluids*	2 IGT (1 vent)
Active chimney*	1 (w/fluid pr)
Inactive chimney	0
Substrate	3
Megafauna	1 + mat slurp
SM2000/pixelfly	20 m alt survey

*Microbiological samples will be taken from active chimney and diffuse fluid samples

Jason2 Dive 135 to Mariner and Vai Lili Vent Fields: April 28, 2015z to April 29, 1040z

2015z: Jason2 launched,
2149z: On bottom
Dive summary: Went in at the Mariner Vent Field and searched for Japanese Markers 95 and 96, finding Marker 95 (coated with Fe-oxide) 45 minutes after reaching the bottom. Took 3 fluid samples from 2 orifices that were ~ 10 meters part, and then attempted to scoop sediment, but scooped only Fe-oxide crust. Went south to x4909, y5754 and slurped orange slime, measuring a temperature of ~24C. Then transited to the domes east of the vent field, which are composed of hummocky, jagged, sediment covered andesite(?). Then went to the "benchtop" site and took a fluid/rock sample pair, and proceeded south to the Vai Lili site. At Vai Lili, started an SM2000 line as we entered the field, and then went to sample bacterial mat. The slurp was clogged, so took a sample of orange-coated rock. Then ran 2 short SM2000 lines to complete the map, and went to Japanese Marker 00. Took two major bottles at the Marker 00 vent, and proceeded south at the top and east side of the eastern ridge. Took three samples from three different structures before ending the dive.
0925z off bottom
1040z on deck

Table 18. Samples collected on J2-135 from Mariner.

Sample types		**Total for field**
Focused fluids	3 IGT (2 vents)	11 IGT (5 vents)
Diffuse fluids*	1 IGT (1 vent)	3 (2 vents)
Active chimney*	1 (w/fluid pr)	6 (3 w/fluid)
Inactive chimney	1 sediment scoop	2 + sed scoop
Substrate	0	2
Megafauna	1 mat slurp	2 + 2 mat
SM2000/pixelfly (~40m^2)		Completed SM2000 map of field

*Microbiological samples will be taken from active chimney and diffuse fluid samples

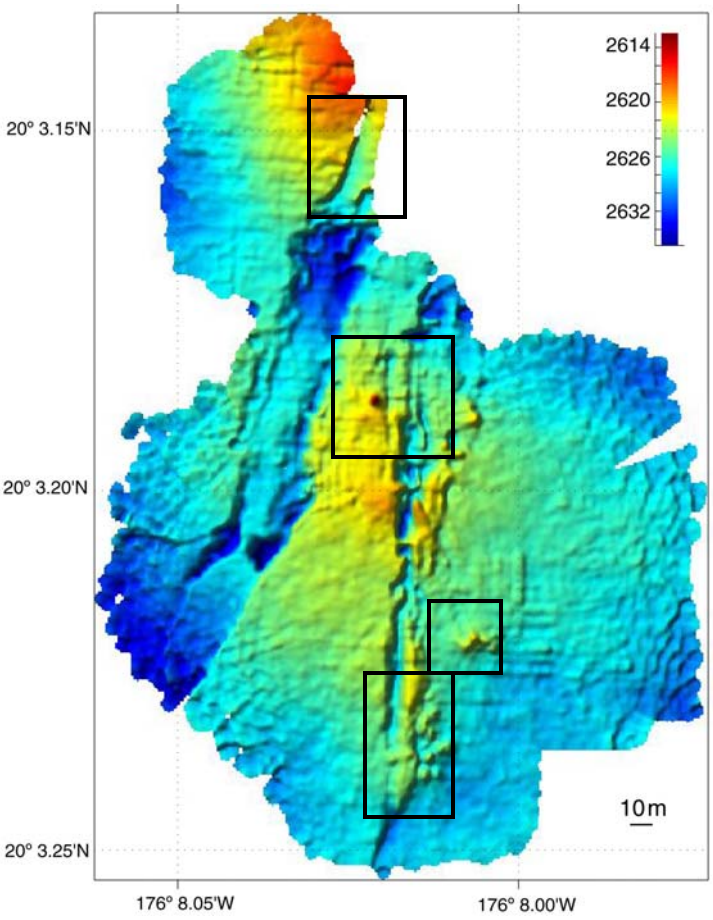
Table 19. Samples collected on J2-135 from Vai Lili.

Sample types		**Total for field**
Focused fluids	2 (1 vent, same as 133)	6 IGT (2 vents)
Diffuse fluids*		2 IGT (1 vent)
Active chimney*		1 (w/fluid pr)
Inactive chimney	3	3
Substrate	1	4
Megafauna	1 mat slurp	1 + 2 mat slurp
SM2000/pixelfly (~40m^2)	2 short SM2000 lines to complete the map	Completed SM2000 map of field

*Microbiological samples will be taken from active chimney and diffuse fluid samples

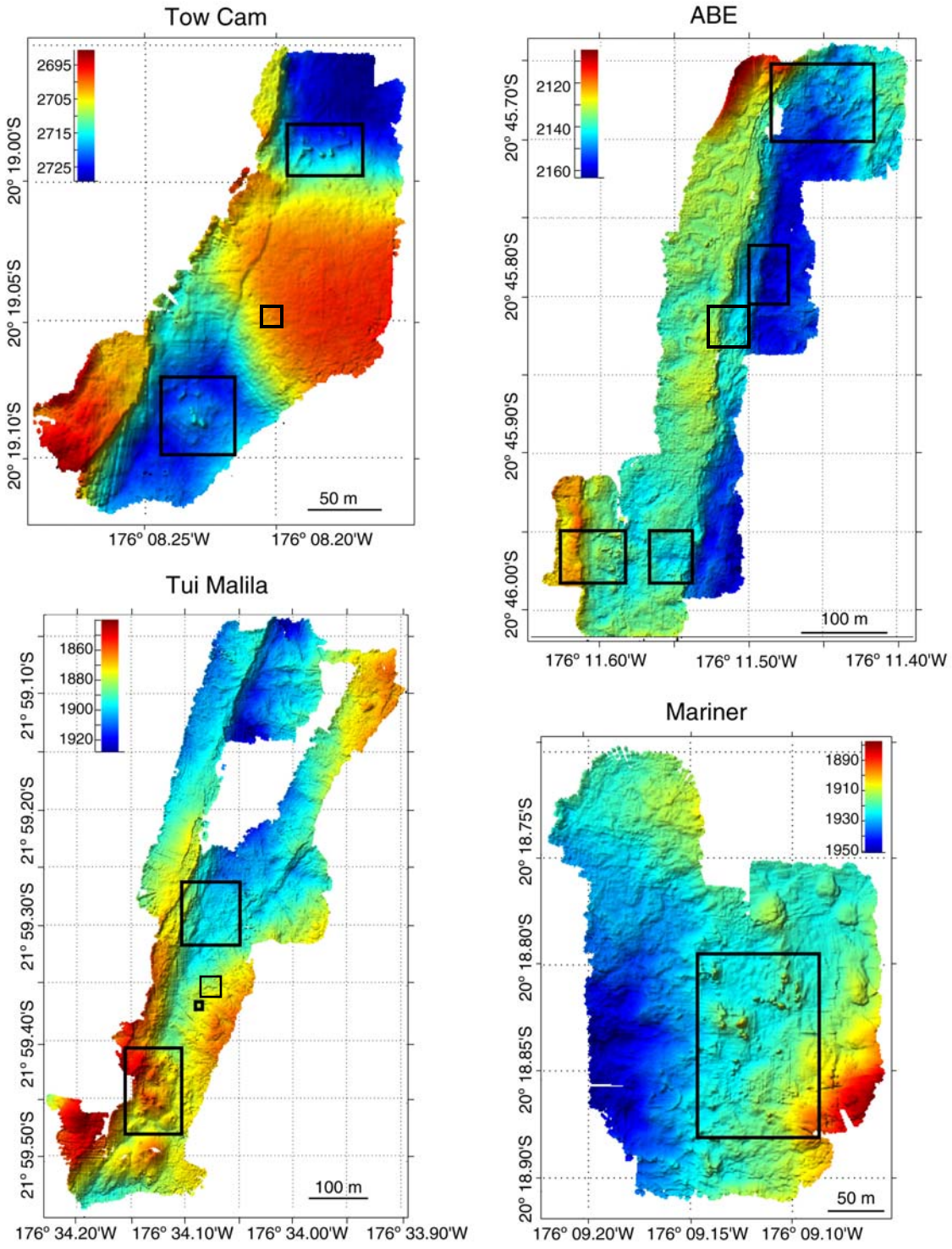
Preliminary results

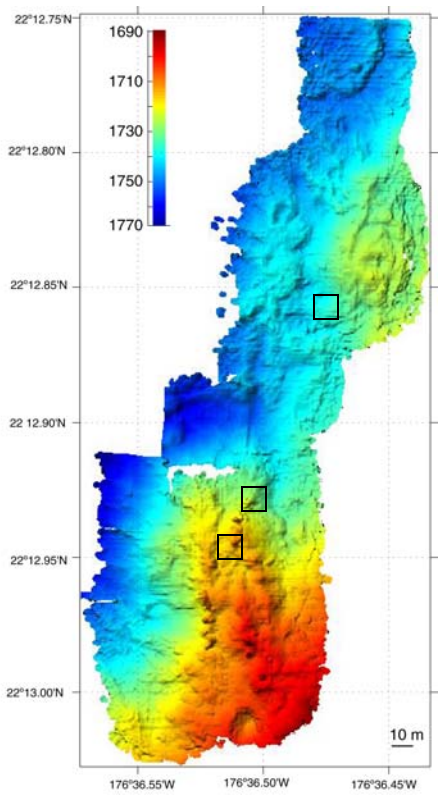
Preliminary SM2000 Maps of Vent Fields



Kilo Moana Vent Field

High-resolution (0.5 m grid) bathymetric maps were derived from near-bottom SM2000 multibeam surveys conducted with ROV *Jason2*. See appendix 4 for maps in x-y coordinates. Black boxes denote areas of active venting.


Tow Cam
2695
2705
2715
2725
20° 19.00'S
20° 19.05'S
20° 19.10'S
50 m
176° 08.25'W
176° 08.20'W
ABE
2120
2140
2160
20° 45.70'S
20° 45.80'S
20° 45.90'S
20° 46.00'S
100 m
176° 11.60'W
176° 11.50'W
176° 11.40'W
Tui Malila
1860
1880
1900
1920
21° 59.10'S
21° 59.20'S
21° 59.30'S
21° 59.40'S
21° 59.50'S
100 m
176° 34.20'W
176° 34.10'W
176° 34.00'W
176° 33.90'W
Mariner
1890
1910
1930
1950
20° 18.75'S
20° 18.80'S
20° 18.85'S
20° 18.90'S
50 m
176° 09.20'W
176° 09.15'W
176° 09.10'W



Vent Deposits

At the Kilo Moana, Tow Cam, ABE and Tui Malila vent fields, hydrothermal activity occurs in proximity to major faults. In contrast, within the Mariner and Vai Lili vent fields, hydrothermal activity is not related to faulting, but may be concurrent with magmatic processes.

At Kilo Moana, active venting occurs in three areas from ~5m tall, branched structures: Focused, high-temperature flow (332 °C) from open-channeled chimney orifices and diffuse flow from beehive structures. Chimney structures are tall (~ 5m), with orifices lined with Cu-Fe sulfide (chalcopyrite) at high-T vents and Zn-Fe sulfide (wurtzite) at lower-T vents.

At Tow Cam active venting occurs in two areas at the base of a western fault and diffuse flow exits basalt east of the black smoker areas. Venting occurs as gray/white smoker fluids from beehive structures. Black smokers are less abundant. Maximum temperatures are ~ 330 °C. Most deposits are small, low-lying chimneys and mounds (< 2m tall), composed dominantly of Fe-Zn sulfide. Chalcopyrite and wurtzite occur as linings of conduit walls of chimneys.

At the ABE Vent Field, there are three large areas of active venting spaced 150 to 300 m apart along NNE trending faults and benches; diffuse flow from volcanic substrate is common. High-temperature (> 300ºC) flow occurs from tall chimneys with chalcopyrite and/or wurtzite lining conduits. Lower temperature (140 - 288ºC) flow exits beehive structures and flanges.

At Tui Malila there are two large venting areas at the base of a western fault with focused, high-temperature flow (to 312 °C), flange structures (up to 175 °C flows), beehive structures, diffuse flow from volcanic substrate, and older inactive deposits. High-temperature vents vary from Cu-Fe-rich to Fe-Zn-rich in composition. Beehives are more enriched in Zn. Flanges are Ba-Zn-rich. Hydrothermal breccias are present.

Vents at the Mariner Vent Field exhibit the highest temperatures (363 °C) measured for vent fields at Lau. Both focused and more diffuse flow occurs from the base and sides of single,

large (10 -25m tall), narrow chimney structures. Cu-Fe sulfides are common, particularly from high-T orifices. Thick mats of Fe-oxide are present at areas of low temperature (~20 to 55ºC) diffuse flow.

At the Vai Lili Vent Field, low temperature (≤ 120 °C), focused flow occurs from flanges and Fe-oxide chimneys. Minor diffuse flow occurs through broad sulfide mounds and flanges. Marcasite lines the underside of flanges. Chalcopyrite is not observed in actively venting samples. Abundant large inactive structures are present.

Vent Fluid Chemistry

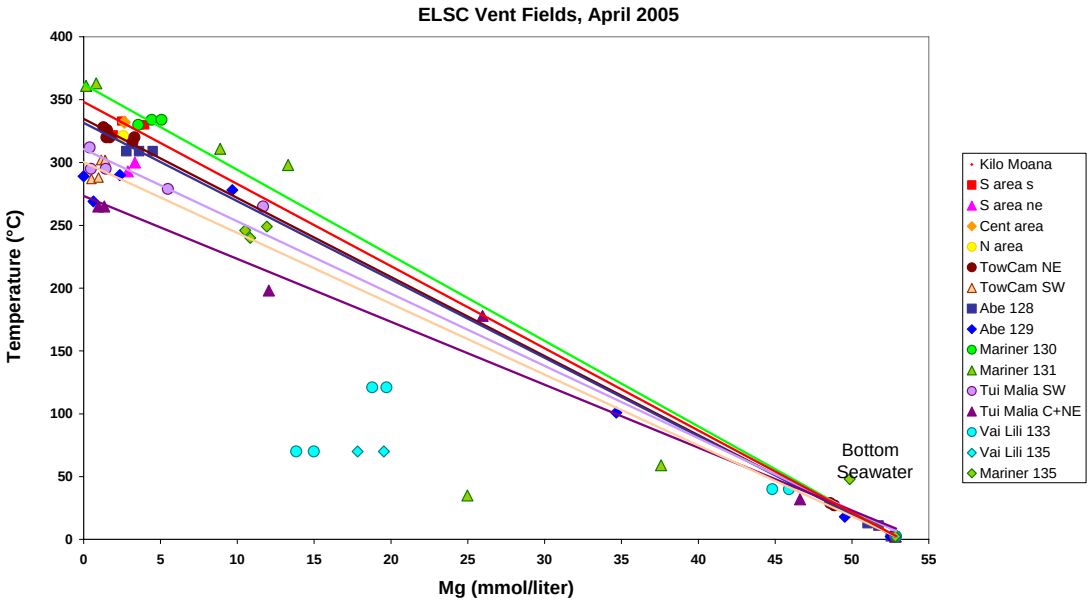
Fluid samples were collected with isobaric gas-tight fluid samples from focused flow vents (48 samples) and areas of diffuse flow (18 samples) and analyzed for a variety of dissolved ionic species and gases onboard ship (pH, Cl, F, SO_4, Br, Ca, H_2S, H_2, CH_4, and CO). Thirteen additional samples were collected using "major" samplers for the analyses of U-series decay radioisotopes. Maximum measured vent temperatures at Kilo Moana and Towcam were characterized by similar values near 330°C, while the ABE and Tui Malila areas were slightly cooler with maximum temperatures of 309 and 312°C, respectively. The Mariner vent field had the highest measured temperature of 363°C with many vents near 335°C. Only diffuse flow was observed at the Vai Lili field where temperatures varied from 40 to 121°C. Recognizing that all data are preliminary, a brief summary of vent fluid chemistry is provided below.

Shipboard chemical analyses revealed significant compositional variability at the scale of individual vent structures within a given field. Phase separation of high temperature hydrothermal fluids is suggested by measured Cl concentrations that varied from 530 to 650 mmole/liter. Relative to bottom seawater (Cl=538 mmole/liter), endmember fluids from the Towcam, Abe, and Mariner fields were both Cl-depleted and Cl-enriched. Only Cl-enriched endmember fluids were observed at the Kilo Moana, Tui Malila, and Vai Lili areas, although our sampling coverage may not have been sufficient to reveal the presence of Cl-depleted fluids. Dissolved Ca concentrations varied from 32 to 48 mmole/liter with a substantially smaller range within a given vent field. Measured endmember pH (25°C) values varied from 2.5 to 4.6.

Dissolved H_2 concentrations in endmember fluids varied by an order of magnitude from 48 to 485 μmole/liter. In general, H_2 concentrations decreased systematically from the northern basalt hosted Kilo Moana vent field to the southern andesite hosted fields at Abe, Tui Malila, and Mariner. Measured CH_4 abundances varied from 28 to 58 μmole/liter at Kilo Moana, Towcam, Abe, and Tui Malila, but remained essentially constant within a given vent field. Despite significantly higher total gas contents (most likely CO_2) at the Mariner vent field relative to the other areas, dissolved CH_4 concentrations were significantly lower at 5 to 9 μmole/liter. High total gas contents in the Mariner fluids were accompanied by F concentrations in excess of seawater values suggesting a possible contribution of magmatic volatiles to these fluids. Endmember fluids from the other vent fields where total gas abundances (CO_2) were significantly lower where characterized by F concentrations that were significantly less than bottom seawater. Dissolved endmember CO concentrations varied from 0.001 to 0.4 μmole/liter. In general, the abundance of CO showed a positive and systematic correlation with aqueous H_2 suggesting thermodynamic equilibration according to the water-gas shift reaction ($CO_2 + H_2 = CO + H_2O$). Dissolved H_2S concentrations varied from 1 to 6.5 mmole/liter. Significant variability in the abundance of H_2S in fluids that were otherwise compositionally similar

suggests subsurface precipitation of metal sulfides may have been influencing the abundance of aqueous sulfide.

For most chemical species measured onboard ship, the composition of the diffuse flow fluids is consistent with conservative mixing of high temperature vent fluids and bottom seawater. This is not the case, however, for aqueous H_2 and H_2S, which showed significant depletions relative to values predicted for mixing.



Hydrocasts

Twenty hydrocasts were performed at seven different sites on Cruise TUIM05MV. Eleven of these were tow-yos, on which no water was collected. Nine were vertical casts on which water and particles were collected, and one tow-yo ended with a vertical ascent on which water and particles were also collected. Details are given in Tables 20 and 21. Table 20:

Table 1. Summary data on all hydrocasts and tows

Official name: TiveyCast	Our name: Cast #	Tow #	Site	Xpdr navig'd?
1	1		Kilo Moana	yes
2	2		TowCam	no
3	3		ABE	no
4	4		Mariner	no
5	5		Vai Lili	no
6		1	Tui Malila	no
7		2	Tui Malila	no
8		3	Tui Malila	yes
9		4	Tui Malila	yes
10		5	21°06'S	yes
11		6	21°06'S	yes
12		7	21°06'S	yes
13		8	21°06'S	yes
14	6		Tui Malila	no
15	7		Tui Malila	yes
16	8		Mariner	no
17		9	Tui Malila	yes
18		10	Tui Malila	yes
19	9	11	Tui Malila	yes
20	10		TowCam	no
21	11		Kilo Moana	no

Table 21. CTD Stations.

Table 2. CTD Log Sheet Tivey Lau 2005

Cruise TUIM05
Ship Melville
Cast Hydro

Date	Official name: TiveyCast	Station ID	CTD Cast #	Relay xpdr?	Time In	Time at Bottom	Lat S	Long W	Depth (m) of CTD lowering	Altitude (m)
4/8/2005	1	Kilo Moana	1	yes	7:53:52	8:50	20 3.1947	176 3.2005	2611	42.36
4/11/2005	2	TowCam	2	no	20:03	21:02	20 18.988	176 8.174	2710	20
4/14/2005	3	ABE	3	no	3:13	4:14	20 45.750	176 11.450	2131	20
4/16/2005	4	Mariner	4	no	4:44:30	5:37:22	22 10.819	176 36.901	1870	47
4/17/2005	5	Vai Lili	5	no	16:13:43	16:53:25	22 12.899	176 36.500	1722	27.35
4/23/2005	14	Tui Malila	6	no	19:25	20:02	21 59.245	176 34.003	1887	12
4/25/2005	15	Tui Malila	7	yes	3:48:30	4:25:00	21 59.180	176 33.953	1873	15
4/25/2005	16	Mariner	8	no	7:07:35	7:46:54	22 10.805	176 36.108	1911	14
4/29/2005	19	Tui Malila	9	yes	22:10	22:50	21 58.859	176 33.859	1913	15
5/1/2005	20	TowCam	10	no	19:10:32	20:00:00	20 18.988	176 8.714	2685	17
5/3/2005	21	KiloMoana	11	no	16:47:00	17:33:00	20 3.192	176 8.017	2608	15.5

Vertical casts were performed over known sites of venting and all showed non-buoyant hydrothermal plumes at one or more depths. Casts 1, 2, 6, and 8 (Tiveycasts 1, 2, 14, and 16) also intersected buoyant plumes. Tow-yos were performed to pinpoint the location of suspected vent fields at 21˚06'S and 21˚59'S. Buoyant as well as neutrally buoyant plumes were found at both of these sites; locations of buoyant plumes at 21˚59'S were targeted on Jason-2 Dive 132, which discovered the Tui Malila vent field. No dive was made at 21˚06'S so the precise location of venting there remains unknown. Details of our search are provided in Appendix 2. Tow-yo details are provided on the enclosed CD.

Microbiological Analyses

The goal of our proposed work was to establish the microbial framework for the Lau ISS. To this end, we have focused our efforts on high temperature sulfides and diffuse flow fluids, however, samples were collected for Katrina Edwards lab to characterize the microbiology of iron oxides associated with low temperature extinct sulfides. Additionally, samples were collected for Victoria Orphan, Caltec, for enrichment culturing of anaerobic methane oxidizers. Wherever possible, we have fluid chemical data for all sulfides collected. Additional, Meg Tivey has companion sulfides for mineralogical and modeling purposed.

All samples were subsampled for molecular and microbial culturing purposes. DNA was extracted at sea, and the archaeal and bacterial 16S rRNA genes were amplified by PCR from a selection of samples. Additionally, the presence of Aquificales and an unidentified lineage, the

DHVE archael group, was explored using PCR primers specific for these groups. A selection of DNAs were also screened for functional genes that are diagnostic for certain pathways, viz, acl (reductive TCA cycle), mcrA (methanogenesis), nir S (nitrate reduction), nirK (nitrate reduction), amoA (ammonia oxidation). No nirK or amoA genes were amplified, however, in all cases for the PCR-related detections, a negative does not necessarily mean the gene is not present, but perhaps our conditions for amplification of these genes was not optimal. Once in Portland, we will optimize the DNA extractions and PCR conditions for all samples.

Culturing of thermophiles, both acidophiles and neutrophiles, was initiated at sea, and will be completed once we return to Portland. We have over 30 hydrogen oxidizing (H_2 and O_2) or nitrate reducing (H_2 and nitrate) chemolithoautotrophs growing at 70°C, and about 10 sulfur reducing chemolithoautotrophs growing at 85 or 60°C. Preliminary enrichments of thermophilic iron oxidizers were obtained. DNA was extracted from all cultures that appeared to be pure, and the 16S rRNA will be determined once we are back in Portland. The hydrogen oxidizers and nitrate reducers are most likely new representatives of the Aquificales.

Although the geological setting, geochemistry and mineralogy of the different sites points to potentially interesting selection pressures for the microbial ecology, it is too early to make any conclusions regarding the patterns of microbial diversity and physiology.

Lists of samples collected for microbiological analyses are given in Appendix 3.

Table 22. Summary of preliminary microbiological studies at ESLC. Numbers of positive/number of samples tested. No data refers to not tested.

Site	Visible DNA	Bacteria	Archaea	Aqui-ficales	DHVE	mcrA	nirS	acl	H2-oxidizer 70C	Nitrate reducer 70C	S-reducer
Kilo (124-25, 137)	2/11	2/11	2/11	2/2	2/2	0/4		0/1	5	4	2 (60C) 2 (85C)
Tow Cam(126-27,139)	6/17	4/15		4/4	2/2	1/6		3/3	3	2	1 (60C) 3 (85C)
ABE (128-29,136)	14/43	19/30	2/12	3/12	9 /11	1/9		1/3	8		3 (60C) 3 (85C)
Mariner (130-31, 135)	3/14	13/13		3/12	1/13	7/28		2/9	3		
Tui Malila (132,138)	0/1			1/1					1		
Vai Lili (133,135)									1		

Macro/Megafaunal Studies

Kilo Moana Vent Field

The three actively venting areas within the Kilo Moana Vent Field have megafaunal communities dominated by *Alvinoconcha*, *Ifremeria* and *Bathymodiolus*. Scale worms are active in these areas as well. A few alvinellids were found on smokers. There are peripheral areas where small unidentified anemones dominate, and localized patches of sessile and stalked barnacles.

The following were observed: Limpets, *Bathymodiolus*, *Alvinoconcha*, *Ifremeria*, alvinellids, scale worms, small anemones, gooseneck barnacles, sessile barnacles, hexactinellid.

Down-looking pixelfly imagery was taken within the three active areas. Vertical mosaics of some structures, and image transects across the seafloor were also done.

Tow Cam Vent Field

The two actively venting areas within the Tow Cam Vent Field have sparser megafaunal communities than the Kilo Moana site, with different dominants. Seastars, as well as *Bathymodiolus*, anemones and cucumbers are found in dense patches. One small patch of tubeworms was found. The bases of pillars are ringed with piles of dead gastropod shells, and occasional white snails and egg cases that may be from the same species are seen. Only shells of *Calyptogena* were seen, lining crevices in peripheral areas.

The following were observed: *Bathymodiolus*, *Alvinoconcha*, *Ifremeria*(?), white snails, seastars, tubeworms, anemones, cucumbers, sessile barnacles.

Down-looking pixelfly imagery was taken within the two active areas.

ABE Vent Field

The visible megafaunal community within the ABE Vent Field was generally similar to that within the Kilo Moana Vent Field. Mussels hosted large Branchipolynoe and there were several other species of polychaete, including an unidentified serpulid, in crevices in the rugose andesitic substrate.

The following were observed: *Bathymodiolus, Alvinoconcha, Ifremeria,* alvinellids, scale worms, small anemones, sessile barnacles, Branchipolynoe, serpulid polychaetes.

Tui Malila Vent Field

The newly discovered vent field at 21°59' has the largest community of vent fauna observed on this cruise. Extensive areas of diffuse flow support dense assemblages of *Alvinoconcha, Ifremeria and Bathymodiolus*, along with limpets. Chorocaris shrimp, Munidopsis and bythograids are abundant among the molluscs and on nearby substrate. Large anemones are found in patches in some areas among the Bathymodiolus. Small anemones and sessile barnacles are found in patches in peripheral areas, as well as unusual "lollipops" (possibly sponges?) In the area of focused venting and spires, scale worms and the crustaceans are found on structures where flow is diffusing through porous substrate.

Mariner Vent Field

Within the Mariner Vent Field Chorocaris shrimp and bythograids were abundant. Polychaetes and "lollipops" (sponges?) were patchily distributed on porous peripheral substrate. Several other species were seen rarely: scale worms, galatheids, mussels, another shrimp species,

and seastars.

Vai Lili Vent Field

At the Vai Lili Vent Field there was little evidence of vent specific fauna. A few snails (not a recognizable vent species) and shrimp were seen. The large areas of dead mollusc shells recently observed by the Japanese expedition were not found.

MOCNESS Summary

Six successful MOCNESS tows were completed, one at each site. The depths and some location information for the neutrally buoyant plumes were known from prior CTD casts in each area. Most plumes were 100-200 meters above bottom. Bottom current directions were predicted from observations made during Jason dives, and were southwards in the northern sites, and northwards in the Valu Fa sites. Generally, plumes could be recognized by excursions in transmissivity and occasionally temperature. At Vai Lili and Tow Cam, tow direction (which was constrained by wind direction) allowed nets to be open for 30 minutes; at all other locations nets were open for 15 minutes each. Net mesh was 150 μm.

Table 23.

Site	Water depth (m)	Plume depth (m)	# samples in plume
Kilo Moana	2640	2300-2440	1
Tow Cam	2720	2220-2370	4
ABE	2140	1870-2000	4
Tu'I Malila	1860	1770-1800	4
Mariner	1920	1725-1775	5
Vai Lili	1740	1650	0*

* we did not detect a plume with the MOCNESS instrumentation at this site

Quick visual inspection of the samples before preservation found megalopa that are likely of vent origin. Combined with reproductive data from adults on the seafloor, this will give us an initial sketch of reproductive strategies in vent gastropods.

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Appendix 1: Transponder Information

Transponder summary – Two transponders had been left in September 2004 at the Kilo Moana Vent Field, the Tow Cam Vent Field, the ABE Vent Field, and "site 4" at 21 6.2'S. Of these 25% (one at Kilo Moana, one at ABE) failed to respond at all, and one at the Tow Cam site gave a weak signal. The two left at "site 4" could be heard as we steamed by at 10 knots.

We tried to release each of the non-responsive transponders with no luck. On May 3 a search was made for Transponder A near the ABE Vent Field using Jason2 and the imogenex. There was no sign of the transponder despite scanning at the location from a depth of x to 1993 meters. On May 4, on a return dive to the Kilo Moana Vent Field, it became apparent that Transponder A was no longer talking. By this time we had lost so much time to weather that we were unable to modify our schedule to attempt a daytime release of this transponder. We also were unable to dive with Jason during the daytime to search for Transponder B at the Kilo Moana Vent Field.

Transponders at "site 4" at 21°6.2'S were recovered successfully, as were those we had deployed at the Mariner and Vai Lili Vent Fields, and at Tui Malila.

MAY 6, 2005

TUIM05MV MELVILLE TIVEY APR 05 ALBL Coordinate System Origin 1 Kilo Moana
1 -20 -09.000 -176 -12.000 0.000 0000.0 0000.0 0.0000

A not talking May 04,2005, was good for Medea & Jason April 5,6,7,8
A -20 -03.3619 -176 -08.6308 5870.79 10402.35 2428.9 589528.95 7782088.80 was OK
B -20 -04.8891 -176 -09.1092 5037.18 7584.65 2458.1 588680.81 7779276.13 Not Talking
C –20 –02.04860 -176 –08.36198 6339.20 12825.40 2432.0 590009.96 7784508.78 10.5

TUIM05MV MELVILLE TIVEY APR 05 ALBL Coordinate System Origin 2 Tow Cam
1 -20 -22.000 -176 -12.000 0.000 0000.0 0000.0 0.0000

Good Medea Nav, only a couple of Jason in water column, No 8.5 or 9.5
A -20 -19.4905 -176 -09.1932 4884.03 4630.17 2337.2 588396.95 7752344.15 OK
B -20 -20.0171 -176 -07.1974 8356.86 3658.56 2367.2 591864.39 7751354.62 OK

TUIM05MV MELVILLE TIVEY APR 05 ALBL Coordinate System Origin 3 Abe
1 -20 -50.000 -176 -16.000 0.000 0000.0 0000.0 0.0000

Good Medea Nav, very little Jason Nav (9.5 poor reception at Jason)
May 03,2005 Search location with J2 and Imagenix for "A" No sign of transponder
A -20 -47.0237 -176 -10.6523 9277.10 5491.74 2029.4 585602.20 7701569.41 Not Talking
B -20 -45.5734 -176 -10.1658 10121.07 8167.77 2071.0 586459.92 7704240.38 OK
C -20 -46.70814 -176 -10.74159 9122.20 6074.00 2071.8 585450.26 7702152.30 11.5

TUIM05MV MELVILLE TIVEY APR 05 ALBL Coordinate System Origin 4 Site 4
1 -21 -08.000 -176 -20.000 0.000 0000.0 0000.0 0.0000

No Jason dive at this site
Transponder A #68264 was release code "A" not "F"
A -21 -06.9085 -176 -16.6004 5885.81 2014.06 1947.9 575118.17 7664938.41 OK Recovered
B -21 -05.8584 -176 -16.1415 6680.31 3951.73 1973.8 575921.38 7666871.88 OK Recovered

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TUIM05MV MELVILLE TIVEY APR 05 ALBL Coordinate System Origin Tui Malila
1 -22 -01.000 -176 -35.000 0.000 0000.0 0000.0 0.0000 ***(Was White Church or 21 59)***

Good nav except at vent sites in gully
A -21 -58.29411 -176 -32.65618 4033.40 4993.50 1732.2 547050.61 7570249.99 Recovered 11.0
B -22 -00.07414 -176 -33.57478 2452.60 1708.60 1726.1 545460.48 7566970.81 Recovered 10.0

TUIM05MV MELVILLE TIVEY APR 05 ALBL Coordinate System Origin 5 Mariner & Vai Lili
1 -22 -14.000 -176 -39.000 0.000 0000.0 0000.0 0.0000

Good Jason and Medea Nav
A -22 -11.65052 -176 -36.11646 4954.60 4335.90 1575.9 541032.06 7545626.46 Recovered 10.5
B -22 -11.41014 -176 -37.48036 2611.10 4779.50 1551.7 538689.94 7546075.89 Recovered 11.0

ID LAT (S) LON (E) X Y Z X Y
UTM ZONE 1

DSL Transponder deployed

Appendix 2:
Search for Hydrothermal Vents at Langmuir Site 4 near 21˚06'S

April 20-21, 2005

Site 4 was first identified in the MAPR data collected on three tows along the ELSC during the F. Martinez *Kilo Moana* cruise in 2004. It appears as a strong (~2 dNTU) and areally concentrated nephelometry signal at 1900-2100m depth and about 200-400 m off bottom, centered at about 21˚06'S, in tows both just east and just west of the axis. The anomaly extends from 21˚5.28-6.24'S in Tow 1 west of the axis and from 21˚6.06-7.8'S in Tow 2 east of the axis. Tow-yo T04C-08 along the axis, done on the same cruise, found the anomaly at 21˚6.24-7.2'S and at the same depth.

The ELSC axis at this site consists of an intermittent axial summit graben 400-700 m wide and 20-140 m deep (to 2280-2300m; maximum 2400m to N at 21˚04'S) bounded by a pair of ridges about 3 km apart that rise to 2180m. About 4.5 km east of Site 4 lies a small seamount, circular in plan view, that rises to 2020m depth. A larger circular seamount 10 km to the NE rises above 2060m. (It lies on the edge of our map so that I could not determine the actual minimum depth.)

The MAPR signals were targeted on the C. Langmuir *Kilo Moana* cruise in 2004 for Phase 1 and 2 ABE surveys separated by tow-yo CTD 07. The Phase 1 ABE survey comprised 20 E-W tracklines each 750 m long across the axis from 21˚6-7'S at an altitude of 200(?) m. These tracks found strong plume signals in T and optical backscatter extending from NW to SE through the center of the survey area, plus a strong and less localized signal in eh. ABE depth increased spontaneously at only a single point, at 21˚6.33'S, 176˚17.25'W, over the eastern wall of the axial summit graben, possibly indicative of a buoyant plume at that location. Tow-yo CTD 07 was run next, from 21˚6.495-6.807'S, from NE to SW paralleling the T and backscatter anomalies but just to the south of them; this tow-yo detected little or no plume signal. The Phase 2 ABE survey was run next, comprising 7 1100-m long NE-SW tracklines at a height 50 m below the plume, at 150(?) m altitude and centered over the Phase 1 anomalies. This survey likewise detected little or no plume signal, except in (the ubiquitous) eh.

The fact that the plume seen in the ABE Phase 1 survey was not detected in the deeper Phase 2 survey indicated to us that the plume originated outside of the survey area, probably on the eastern wall of the axial summit graben, as suggested by the single ABE depth increase seen in the Phase 1 survey. Wind and seas constrained us to towing from SSW to NNE, along the axis. We ran four lines along this course over the target area, extending from up to 3 km to the south and 7 km to the north. The first (Tow 5, Cast 10) was run over the western wall of the axial summit graben, as we suspected that bottom currents ran generally northward and we wanted to be sure we intersected the plume. To our surprise, we found almost no plume signals on this line. We ran the second line (Tow 6, Cast 11) over the eastern wall, 500-1000 m east of the first line. This line yielded moderate plume signals in potential T and light transmittance, centered at 2025m and 2150m depth at 21˚5.8-6'S, 176˚17.05-17.11'W, but no buoyant plumes. We ran the third (Tow 7, Cast 12) and fourth (Tow 8, Cast 13) lines between the first two, 200 m and 100 m west of the second line, respectively. Moderate neutrally-buoyant plume signals on these lines defined an active area near the eastern wall of the axis from 21˚6.5'S, 176˚17.4'W in the southwest to 21˚5.9'S, 176˚17.1'W in the northeast. Only one lowering (at 12:04z on Tow 8, Cast 13) captured what is almost certainly a small (0.005˚C in potential T) buoyant plume signal, 15-25 m off bottom, at 21˚6.445'S, 176˚17.345'W (bottom-mounted transponder fix).

Appendix 3: Microbiological sub-samples by Reysenbach lab, TUIM05MV

Dive	Area	Station	Sample	Sample Sheet Description	Temp-in	Temp-out	aliquots	#subsample types	associated samples
J2-124	Kilo-Moana	1	J2-124-2-R1	White Spire Active	nT		1-25	2	none
J2-124	Kilo-Moana	5	J2-124-5-R1	White Spire smoking after sampling			26-49	2	none
J2-125	Kilo-Moana	10	J2-125-10-R1	Outside of friable active spire	127.6	3.8-7.5	50-62	1	none
J2-126	Tow Cam	1	J2-126-1-R1	Friable sulfide chimney piece	325		63-64	2	J2-126-1-W1&2-IGT2,3
J2-126	Tow Cam	5	J2-126-5-R1	Active sulfide with tube worms	318	19	65-163	44	J2-126-5-W1-IGT-7
J2-126	Tow Cam	3	J2-126-3-W1-IGT4	Diffuse flow water sample	24		164	1	IGT8 replicate
J2-127	Tow Cam	1	J2-127-1-R1	Base of spires, diffuse flow	303		165-185	2	J2-127-1-W1&2-IGT1,2
J2-127	Tow Cam	5	J2-127-5-R1	Sulfide Spire, focused flow	182		186-207	3	none
J2-127	Tow Cam	1	J2-127-1-R2	sulfide At marker 12 sit	303		208-213	1	J2-127-1-W1&2-IGT1,2
J2-127	Tow Cam	4	J2-127-4-R1	active smoker, sulfide	287		214-231	9	J2-127-4-W1&2-IGT 5,6
J2-128	ABE site	8	J2-128-8-R1	White Spire Active	210	12	232-244	1	none
J2-128	ABE site	5	J2-128-5-R1	Crumbly white spire, diffuse flow			245-329	9	none
J2-128	ABE site	2	J2-128-2-R1	Active flange	148		330-359	4	none
CTD-3				water			360-369		
J2-129	ABE site	1	J2-129-1-R1	Active smoker	??		370-382	2	J2-129-1-W1&2-IGT 3,4
J2-129	ABE site	3	J2-129-3-R1	White Chimney, sulfide	288		383-391	2	J2-129-3-W1&2-IGT 5,6

J2-129	ABE site		J2-129-5-W1-IGT1	Diffuse flow water sample	18		392	1	
J2-130	Mariner	1	J2-130-1-R1	Active sulfide Chimney, fluid sampled	332		393-400	1	J2-130-1-W1&2-IGT 1,2
J2-130	Mariner	1	J2-130-1-R2	Active sulfide Chimney, next to one above			401-426	4	
CTD-4				water			427-436		
J2-131	Mariner	1	J2-131-1-R1	active sulfide	297		437-441	1	J2-131-1-W1&2-IGT 7,8
J2-131	Mariner	4	J2-131-4-B1	slurp			442-449	1	
J2-131	Mariner	4	J2-131-4-R1	White sulfide flange	26-54		450-496	6	J2-131-4-W1&2-IGT5,6
J2-131	Mariner	7	J2-131-7-R1	beehive sulfide	NT		497-518	3	
J2-131	Mariner	8	J2-131-8-R1	Relict spire			519-529	2	
CTD-6				water			530-539		
J2-132	Tui Malila	8	J2-132-8-R1	Small sulfide piece	277		540-553	2	J2-132-8-W1-IGT1
J2-132	Tui Malila	9	J2-132-9-R1	Relict sulfide spire	nT		554-560	1	
J2-132	Tui Malila	13	J2-132-13-R1	Low temp white covered sulfide	246	2.2	561-574	2	
J2-133	Vai Lili	1	J2-133-1-B1	slurp	37		575-582	1	J2-133-1-W1 IGT7,8
J2-133	Vai Lili	5	J2-133-5-R1	Piece of active flange w/pyrite marcasite	120		583-596	4	J2-134-5-W1&W2 IGT 7,8
J2-133	Vai Lili	1	J2-133-1-W2-IGT8	solids from water bottle	39.5		597	1	
J2-133	Vai Lili	1	J2-133-1-W2-IGT7	solids from water bottle	37		598	1	
J2-133	Vai Lili	6	J2-133-6-IGT2	Diffuse flow water sample	69		692	1	

J2-133	Vai Lili	6	J2-133-6-IGT4	Diffuse flow water sample	70		693	1	
J2-134	Tui Malila	10	J2-134-10-R1	Flange	nT		599-613	2	
J2-134	Tui Malila	7	J2-134-7-R1		271	16	614-619	1	
J2-134	Tui Malila	8	J2-134-8-R1	Sulfide diffuse flow	nT		620-645, 651	2	
J2-134	Tui Malila	9	J2-134-9-R1	Active chimney	195		646-650	1	J2-134-9-w1IGT4
J2-135	Mariner	4	J2-135-4-B1	slurp	20		652-659	1	
J2-135	Mariner	5	J2-135-5-R1	benchtop Sample	41		660-691	8	J2-135-5-W1-IGT2
J2-136	ABE site	2	J2-136-2-R1	Rock at water sample	305		694-700		J2-136-2-W1-IGT5
J2-136	ABE site	5	J2-136-5-R1	white spire	Bad T		701-718	2	J2-136-5-W1-IGT4,6
J2-137	Kilo-Moana	1	J2-137-1-R1	Active sulfide chimney	328		736-758	5	J2-137-1-W1-IGT1, J2-137-1-W2-IGT2
J2-137	Kilo-Moana	2	J2-137-2-R1	Active sulfide chimney	302		719-735	2	J2-137-2-W1-IGT3, J2-137-2-W2-IGT5
J2-137	Kilo-Moana	7	J2-137-7-R1	Side of white “beehive” sulfide, near Marker 5.	nT		759-777	3	none
J2-138	Tui Malila	6	J2-138-6-W1-IGT6	Diffuse flow water sample	24		813	1	none
J2-138	Tui Malila	7	J2-138-7-R1	Active sulfide chimney	272		778-812	5	J2-138-7-W1-IGT7, J2-138-7-W2-IGT8
J2-139	Tow Cam	1	J2-139-1-R1	Active sulfide spire at Marker 12 site			814-817	1	none
J2-139	Tow Cam	2	J2-139-2-R1	Active sulfide chimney	308		818-835	2	J2-139-2-W1-IGT5, J2-139-2-W2-IGT6
J2-139	Tow Cam	2	J2-139-2-R2	Active sulfide chimney-Volunteer	308		836-839	2	J2-139-2-W1-IGT5, J2-139-2-W2-IGT6

Appendix 3 (cont.).

Reysenbach Subsample Details TUIM05MV

Lowering	Area	Station	Sample Name	Subsample name	Subsample type
J2-124	Kilo-Moana	1	J2-124-1-R1	J2-124-1-R1-1	outer crust
J2-124	Kilo-Moana	1	J2-124-1-R1	J2-124-1-R1-2	whole
J2-124	Kilo-Moana	5	J2-124-5-R1	J2-124-5-R1-1	outer crust
J2-124	Kilo-Moana	5	J2-124-5-R1	J2-124-5-R1-2	whole
J2-125	Kilo-Moana	10	J2-125-10-R1	J2-125-10-R1-1	whole
J2-126	Tow Cam	1	J2-126-1-R1	J2-126-1-R1-1	whole
J2-126	Tow Cam	1	J2-126-1-R1	J2-126-1-R1-2	whole
J2-126	Tow Cam	5	J2-126-5-R1	J2-126-5-R1-1	outer crust
J2-126	Tow Cam	5	J2-126-5-R1	J2-126-5-R1-2	inner
J2-126	Tow Cam	5	J2-126-5-R1	J2-126-5-R1-3	whole
J2-126	Tow Cam	5	J2-126-5-R1	extensive subsampling	outer crust
J2-126	Tow Cam	5	J2-126-5-R1	extensive subsampling	inner
J2-126	Tow Cam	3	J2-126-3-IGT4	J2-126-3-IGT4-1	diffuse flow water
J2-127	Tow Cam	1	J2-127-1-R1	J2-127-1-R1-1	outer crust
J2-127	Tow Cam	1	J2-127-1-R1	J2-127-1-R1-2	inner
J2-127	Tow Cam	5	J2-127-5-R1	J2-127-5-R1-1	outer crust
J2-127	Tow Cam	5	J2-127-5-R1	J2-127-5-R1-2	inner
J2-127	Tow Cam	5	J2-127-5-R1	J2-127-5-R1-3	turret
J2-127	Tow Cam	1	J2-127-1-R2	J2-127-1-R2-1	outer crust
J2-127	Tow Cam	4	J2-127-4-R1	extensive subsampling	whole
J2-128	ABE site	8	J2-128-8-R1	J2-128-8-R1-1	whole
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-1	top/turret-outer
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-3	middle-outer
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-4	middle-middle
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-5	middle-inner
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-6	mid-lower-outer
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-7	mid-lower-middle
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-8	mid-lower-inner
J2-128	ABE site	5	J2-128-5-R1	J2-128-5-R1-9	bottom-outer
J2-128	ABE site	2	J2-128-2-R1	J2-128-2-R1-1	top/outer of flange
J2-128	ABE site	2	J2-128-2-R1	J2-128-2-R1-2	middle of flange
J2-128	ABE site	2	J2-128-2-R1	J2-128-2-R1-3	bottom/inner of flange
J2-128	ABE site	2	J2-128-2-R1	J2-128-2-R1-4	whole
CTD-3					
J2-129	ABE site	1	J2-129-1-R1	J2-129-1-R1-1	outer
J2-129	ABE site	1	J2-129-1-R1	J2-129-1-R1-2	middle
J2-129	ABE site	3	J2-129-3-R1	J2-129-3-R1-1	middle
J2-129	ABE site	3	J2-129-3-R1	J2-129-3-R1-2	whole
J2-129	ABE site		J2-129- -IGT1	J2-129- -IGT1-1	diffuse flow water
J2-130	Mariner	1	J2-130-1-R1	J2-130-1-R1-1	outer
J2-130	Mariner	1	J2-130-1-R2	J2-130-1-R2-2	inner

J2-130	Mariner	1	J2-130-1-R2	J2-130-1-R2-3	whole
J2-130	Mariner	1	J2-130-1-R2	J2-130-1-R2-4	turret
J2-130	Mariner	1	J2-130-1-R2	J2-130-1-R2-2	inner
CTD4					
J2-131	Mariner	1	J2-131-1-R1	J2-131-1-R1-1	outer
J2-131	Mariner	4	J2-131-4-B1	J2-131-4-B1-1	slurp
J2-131	Mariner	4	J2-131-4-R1	J2-131-4-R1-1	outer-rusty
J2-131	Mariner	4	J2-131-4-R1	J2-131-4-R1-2	outer-black
J2-131	Mariner	4	J2-131-4-R1	J2-131-4-R1-3	outer-white
J2-131	Mariner	4	J2-131-4-R1	J2-131-4-R1-4	outer-mixed
J2-131	Mariner	4	J2-131-4-R1	J2-131-4-R1-5	outer-under mat
J2-131	Mariner	4	J2-131-4-R1	J2-131-4-R1-6	inner
J2-131	Mariner	7	J2-131-7-R1	J2-131-7-R1-1	outer-beehive
J2-131	Mariner	7	J2-131-7-R1	J2-131-7-R1-2	middle
J2-131	Mariner	7	J2-131-7-R1	J2-131-7-R1-3	inner
J2-131	Mariner	8	J2-131-8-R1	J2-131-8-R1-1	outer
J2-131	Mariner	8	J2-131-8-R1	J2-131-8-R1-2	inner
CTD-6			CTD-6-1		bouyant plume
J2-132	Tui Malila	8	J2-132-8-R1	J2-132-8-R1-1	outer edge of flange
J2-132	Tui Malila	8	J2-132-8-R1	J2-132-8-R1-2	outer top back of flange
J2-132	Tui Malila	9	J2-132-9-R1	J2-132-9-R1-1	whole
J2-132	Tui Malila	9	J2-132-13-R1	J2-132-13-R1-1	outer
J2-132	Tui Malila	9	J2-132-13-R1	J2-132-13-R1-2	inner
J2-133	Vai Lili	1	J2-133-1-B1	J2-133-1-B1-1	slurp
J2-133	Vai Lili	1	J2-133-5-R1	J2-133-5-R1-1	outer-scrape
J2-133	Vai Lili	1	J2-133-5-R1	J2-133-5-R1-2	outer-whole
J2-133	Vai Lili	1	J2-133-5-R1	J2-133-5-R1-3	inner
J2-133	Vai Lili	1	J2-133-5-R1	J2-133-5-R1-4	whole
J2-133	Vai Lili		J2-133-W2-	J2-133-W2-IGT8-1	black goo
J2-133	Vai Lili		J2-133-W2-	J2-133-W2-IGT7-1	orange goo
J2-134	Tui Malila	10	J2-134-10-R1	J2-134-10-R1-1	outer/top of flange
J2-134	Tui Malila	10	J2-134-10-R1	J2-134-10-R1-2	bottom/inner of flange
J2-134	Tui Malila	10	J2-134-10-R1	J2-134-10-R1-2	middle
J2-134	Tui Malila	7	J2-134-7-R1	J2-134-7-R1-1	outer crust
J2-134	Tui Malila	8	J2-134-8-R1	J2-134-8-R1-2	whole
J2-134	Tui Malila	8	J2-134-8-R1	J2-134-8-R1-1	outer
J2-134	Tui Malila	9	J2-134-9-R1	J2-134-9-R1-1	outer crust
J2-135	Mariner	4	J2-135-4-B1	J2-135-4-B1-1	slurp
J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-1	outer edge of flange
J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-2	white-DNA
J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-3	orange-DNA
J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-4	white and red crust
J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-5	all outer mixed
J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-6	yellow-for DNA

J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-7	middle
J2-135	Mariner	5	J2-135-5-R1	J2-135-5-R1-8	inner
J2-133			J2-133- -IGT2		diffuse flow water
J2-133			J2-133- -IGT4		diffuse flow water
J2-136	ABE site	2	J2-136-2-R1	J2-136-2-R1-1	whole
J2-136	ABE site	5	J2-136-5-R1	J2-136-5-R1-1	inner soft
J2-136	ABE site	5	J2-136-5-R1	J2-136-5-R1-2	wall-outer and middle
J2-137	J2-137	2	J2-137-2-R1	J2-137-2-R1-1	outer
J2-137	J2-137	2	J2-137-2-R1	J2-137-2-R1-2	inner
J2-137	J2-137	2	J2-137-2-R1	J2-137-2-R1-3	whole
J2-137	J2-137	1	J2-137-1-R1	J2-137-1-R1-1	0.6mm outer
J2-137	J2-137	1	J2-137-1-R1	J2-137-1-R1-2	against chalcopyrite
J2-137	J2-137	1	J2-137-1-R1	J2-137-1-R1-3	soft outer friable
J2-137	J2-137	1	J2-137-1-R1	J2-137-1-R1-4	soft outer remainer
J2-137	J2-137	1	J2-137-1-R1	J2-137-1-R1-5	whole
J2-137	J2-137	7	J2-137-7-R1	J2-137-7-R1-1	outer
J2-137	J2-137	7	J2-137-7-R1	J2-137-7-R1-2	inner
J2-137	J2-137	7	J2-137-7-R1	J2-137-7-R1-3	whole
J2-138	J2-138	7	J2-138-7-R1	J2-138-7-R1-1	outer-white
J2-138	J2-138	7	J2-138-7-R1	J2-138-7-R1-2	outer-peach
J2-138	J2-138	7	J2-138-7-R1	J2-138-7-R1-4	inner
J2-138	J2-138	7	J2-138-7-R1	J2-138-7-R1-5	whole
J2-138	J2-138	7	J2-138-7-R1	J2-138-7-R1-6	middle wall
J2-138	J2-138	6	J2-138-6-W1-	J2-138-6-W1-IGT6-1	diffuse flow water
J2-139	J2-139	1	J2-139-1-R1	J2-139-1-R1-1	whole
J2-139	J2-139	2	J2-139-2-R1	J2-139-2-R1-1	outer
J2-139	J2-139	2	J2-139-2-R2	J2-139-2-R1-2	inner
J2-139	J2-139	2	J2-139-2-R2	J2-139-2-R2-1	white coated beehive
J2-139	J2-139	2	J2-139-2-R2	J2-139-2-R2-2	Fe-oxide covered

Appendix 4: Bathymetric maps, sample descriptions and locations by vent field

Samples recovered from the Kilo Moana vent field on TUIM05MV, April-May 2005 (Lat/lon origin -20 -09.000 -176 -12.000)

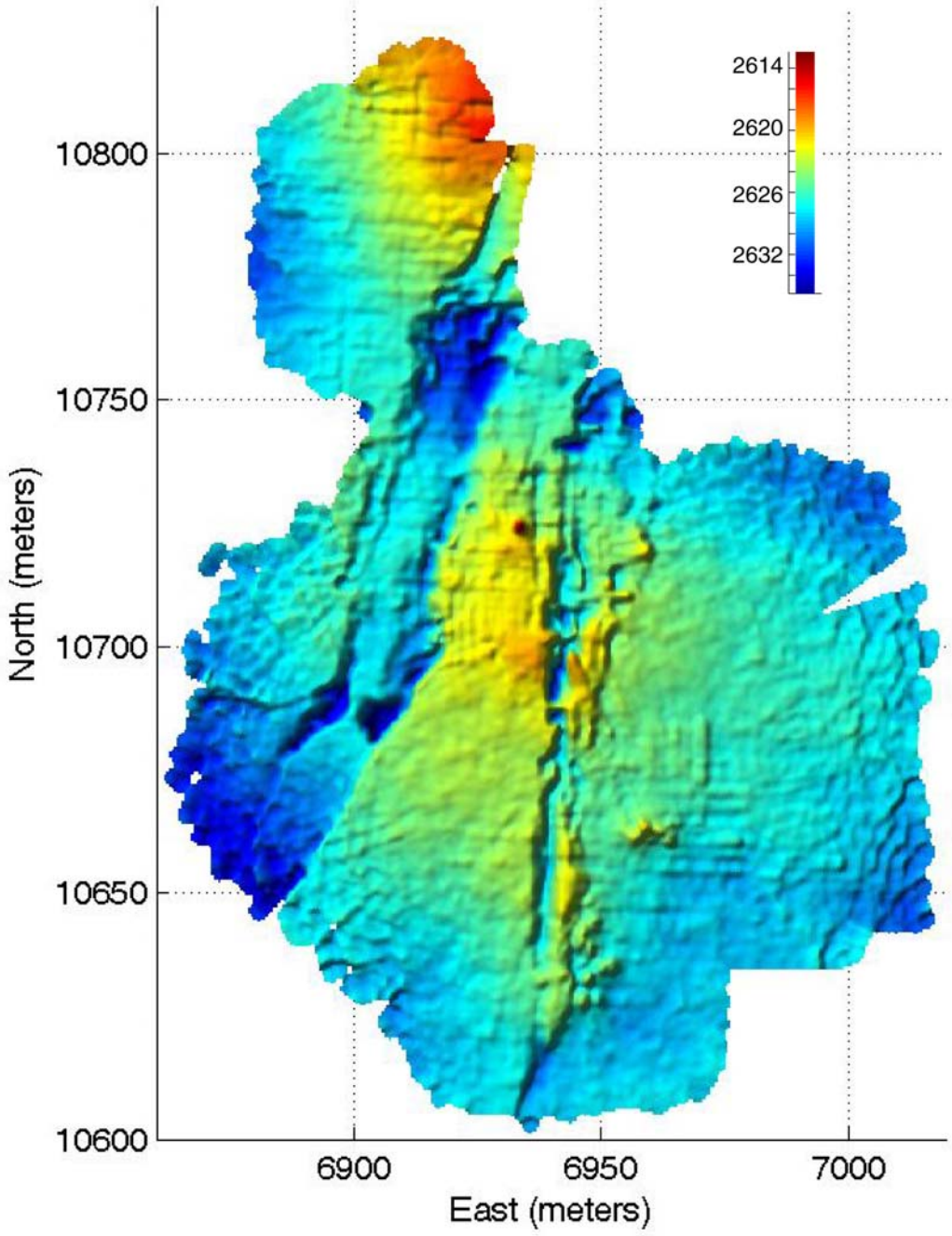
ID#	Sample Number J2-	VV Event #	Date/ Time (UTC)	Position X,Y	Nav version #	Vehicle Depth (m)	Vehicle hdg	Vehicle altitude (m)	Sample Type/collection method	Contact person	Comments
KM1	124-1-W1-IGT4	1574	04/06 08 25	6947, 10638	April/May 05	2619	101	8.6	IGT4 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	High T, focused flow, sulfide chimney. T ~ 316 – 321 °C
KM1	124-1-W2-IGT3	1658	04/06 09 04	6947, 10638	April/May 05	2619	096	8.6	IGT3 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. T ~ 330 – 332 °C
KM1	124-1-W3-Mred	1684	04/06 09 07	6947, 10638	April/May 05	2619	096	8.6	Major Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. Sampled for majors
KM1	124-1-W4-Mgreen	1705	04/06 09 17	6947, 10638	April/May 05	2619	098	8.6	Major Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. Sampled for majors.
M2	Mkr 2	1753	04/06 09 37	6947, 10638	April/May 05	2618	097	8.6	Marker 2		Marker at base of spire complex, in gulley. Location of fluids KM1.
R1	124-2-R1	1777 - 1858	04/06 09 43	6950, 10647	April/May 05	2618	204	8.6	Active sulfide chimney/ Grab	Meg Tivey	Mixed, dendritic Zn, Fe, Cu (?) sulfide w/ cpy conduit lining. No fluid data.
R2	124-misc		04/06 (?)	6950, 10647	April/May 05				Active sulfide chimney/ Grab	Meg Tivey	From -2-R1? Dendritic Zn-rich chimney w/ cpy±sph conduit lining?
B1	124-2-B1	1868	04/06 10 11	6950, 10647	April/May 05	2619	195	8.6	Mussels/ Grab	Stacy Kim	Toward base of spire near white/grey smoker chimney orifice
R3	124-3-R1	2316	04/06 13 31	6965, 10663	April/May 05	2619	276	5.8	Relict sulfide flange/grab	Meg Tivey	Fe-Zn sulfide w/ Fe oxide coating on underside
M1	Mkr 1	2384	04/06 13 59	6965, 10663	April/May 05	2620	300	5.7	Marker 1		Marker at base of sampled extinct sulfide 124-3-R1.

R4	124-3-R2	2402	04/06 14 07	6960, 10672	April/May 05	2624	327	0.9	Pillow basalt/grab	Meg Tivey	Fresh interior w/ Fe-oxidized exterior surface. Proximity to Mkr1, 124-3-R1.
B2	124-5-B1	2674 - 2724	04/06 16 12	6953, 10640	April/May 05	2617	140	6.2	Barnacles/ Grab	Stacy Kim	Gooseneck barnacles from pinnacle of sulfide structure. No active venting?
R5	124-5-R1	2857 - 2874	04/06 17 27	6953, 10639	April/May 05	2618	163	6.2	Active sulfide chimney/ Grab	Meg Tivey	Fe-Zn (±Cu-Fe) sulfide. Sub-sampled for biology. Fluid pair is KM4
KM2	125-1-W1-IGT6	4152 - 4197	04/07 15 35	6929, 10732	April/May 05	2619	324	7.5	IGT6 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	High T, focused black smoker chimney fluid. Max T ~ 320 °C
KM2	125-1-W2-IGT7	4230 - 4258	04/07 15 52	6929, 10732	April/May 05	2618	326	7.5	IGT7 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. Max Temp 336 °C?
B3	125-2-B1	4382	04/07 16 30	6930, 10733	April/May 05	2618	065	7.5	Snails/grab	Stacy Kim	Base of sulfide structure w/ little activity and pervasive Fe-oxide coating
RB1	125-3-B1	4500	04/07 16 55	6931, 10734	April/May 05	2604	054	7.5	Barnacles (w/ inactive sulfide chimney)/ grab	Stacy Kim	Mixed Zn and Fe-rich sulfide (?) w/ pervasive Fe oxide coating. Covered w/ sessile barnacles.
RB2	125-4-B1	4632	04/07 17 28	6921, 10740	April/May 05	2623	123	7.5	Anemones (w/ basalt)/grab	Stacy Kim	Small anemones, collected samples on two host basaltic lava flows.
KM3	125-6-W1-IGT1	4996 – 5060	04/07 19 44	6927, 10788	April/May 05	2620	176	7.5	IGT1 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Active, focused black smoker. Excavated prior to sampling. T ~ 317 – 320 °C
KM3	125-6-W1-IGT8	5106	04/07 20 08	6927, 10788	April/May 05	2620	177	7.5	IGT8 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. No temp data.

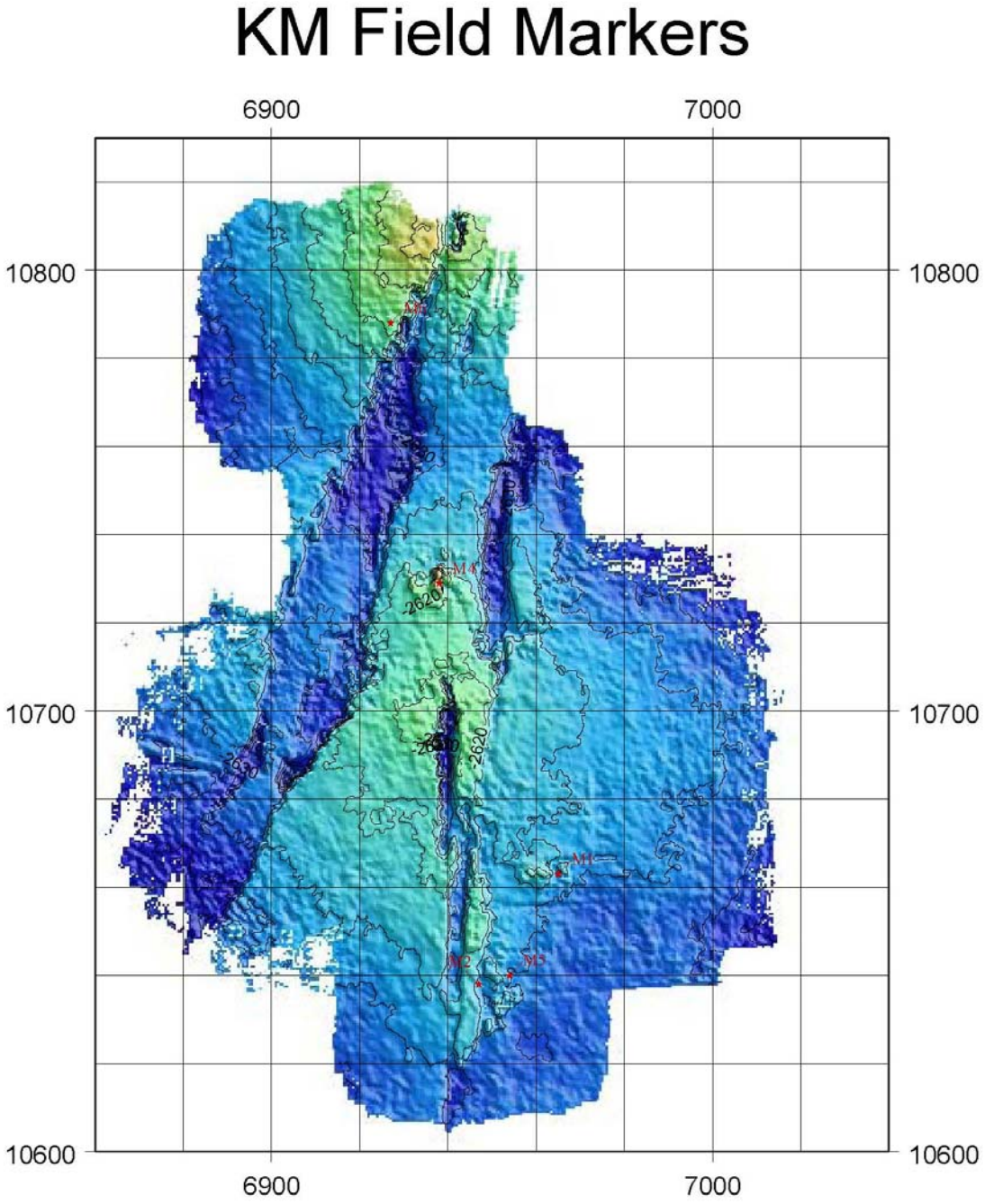
R6	125-6-R1	5313 – 5337	04/07 20 38	6927, 10788	April/May 05	2620	169	7.5	Active sulfide chimney/ Grab	Meg Tivey	Cpy-loaded chimney w/ brown/rust exterior coating. Chimney pair w/ fluids KM3.
B4	125-6-B1	5520	04/07 20 53	6927, 10788	April/May 05	2619	197	7.5	Mussels (>13) Crab/grab	Stacy Kim	From base of chimney complex
M6	Mkr 6	5750	04/07 21 08	6927, 10788	April/May 05	2620	198	7.5	Marker 6		From base of tall chimney complex, next to mussel population
R7	125-7-R1	5876	04/07 21 47	6935, 10786	April/May 05	2620	144	7.5	Relict sulfide/grab	Meg Tivey	Relict dendritic brown sulfide w/ mixed grey/green sulfide. Cpy?
M4	Mkr 4	6106	04/07 22 56	6938, 10729	April/May 05	2620	019	7.5	Marker 4		Base of chimney complex ~ 1-2 m spires w/ black smoker venting
RB3	125-9-B1	6181	04/07 23 19	6921, 10755	April/May 05	2623	350	7.5	Sponge/grab	Stacy Kim	From pillow basalt substrate. No substrate collected
R8	125-10-R1	6259	04/07 23 45	6933, 10736	April/May 05	2618	102	4.7	Active sulfide chimney/ Grab	Meg Tivey	Grey/Black dendritic (?) sulfide w/ interspersed cpy/sph? T ~ 127 °C.
R9	125-11-R1	6417	04/08 00 13	6934, 10737	April/May 05	2621	081	5.9	Relict sulfide/grab	Meg Tivey	Zn-Fe (±Cu-Fe?) rich relict chimney sample. Fe oxide coating.
KM4	125-12-W1-IGT2	6620	04/08 01 45	6954, 10640	April/May 05	2616	142	5.4	IGT2 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Focused, high T fluid sample. Chimney pair is 124-5-R1. T ~ 292 °C.
KM4	125-12-W2-IGT5	6679	04/08 01 55	6954, 10640	April/May 05	2616	142	6.0	IGT5 Water Sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. Tmax ~ 300 °C.
M5	Mkr 5	6703	04/08 02 03	6954, 10640	April/May 05	2616	141	6.3	Marker 5		Atop rich barnacle community nest on tall active sulfide structure. Location for fluids KM4.

R10	137-1-R1	49540	05/03 21 53	6917, 10783	April/May 05	2621	041	1.5	Active sulfide chimney/ Grab	Meg Tivey	Complex bulbous beehive structures and small high T vents. Sample from focused, high T spires.
KM5	137-1-W1-IGT1	49620	05/03 22 03	6917, 10783	April/May 05	2620	065	1.7	IGT1 fluid sample	Jeff Seewald; Mike Mottl; Geoff Wheat	High T black smoker fluid. Fluid pair for sulfide sample 137-1-R1. T ~ 325 °C.
KM5	137-1-W2-IGT2	49651	05/03 22 13	6917, 10783	April/May 05	2620	065	1.7	IGT2 water sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. T ~ 328 °C.
KM6	137-2-W1-IGT3	49839	05/03 23 04	6928, 10733	April/May 05	2619	155	4.1	IGT3 fluid sample	Jeff Seewald; Mike Mottl; Geoff Wheat	From focused black smoker chimney. T ~ 299 °C.
KM6	137-2-W2-IGT5	49871	05/03 23 13	6928, 10733	April/May 05	2619	155	4.1	IGT5 fluid sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Replicate sample, same orifice. T ~ 302 °C
R11	137-2-R1	49895	05/03 23 24	6928, 10733	April/May 05	2619	150	3.9	Active sulfide chimney/ Grab	Meg Tivey	Several pieces, fine-grained Zn(?) sulfide w/ cpy lining conduit. Exterior globular friable sulfide Pair for KM6.
RB4	137-3-RB1	49986	05/03 23 48	6923, 10748 (6937,10760?)	April/May 05	2623	035	0.7	Seastar (w/ host pillow basalt)/ Grab	Stacy Kim	*Brisingid* seastar, recovered on pillow basalt. No fluid activity in area.
B5	137-4-B1, B2	50065	05/04 00 16	6930, 10767 (6925,10752?)	April/May 05	2624	154	0.9	Anemones/ Grab	Stacy Kim	Various species anemones (e.g., *Cerianthid?*). No substrate sampled.
B6	137-5-B1	50174	05/04 00 52	6934, 10725	April/May 05	2618	182	1.2	Anemones/ Grab	Stacy Kim	Small white anemones (sp?) on basalt substrate.
KM7	137-5-W1-IGT7	50240	05/04 01 06	6934, 10725	April/May 05	2618	150	1.4	IGT7 fluid sample	Jeff Seewald; Mike Mottl; Geoff Wheat	Diffuse flow from fissures in basalt. Tmax ~ 10.3 °C
R12	137-6-R1	50552	05/04 03 20	6960, 10663	April/May 05	2613	249	8.7	Active sulfide chimney/ Grab	Meg Tivey	Small spire from atop high T, black smoker chimney. White microbial (?) coating. Fluid pair for KM8.

	137-6-R1-misc	50552	05/04 03 20	6960, 10663	April/May 05	2613	249	8.7	Active sulfide chimney Grab	Meg Tivey	Pieces of active sulfide from different spire at same locale as 137-6-R1.
KM8	137-6-W1-IGT8	50578	05/04 03 31	6960, 10663	April/May 05	2613	249	8.7	IGT8 fluid sample	Jeff Seewald; Mike Mottl; Geoff Wheat	High T, black smoker fluid. Fluid pair for sulfide 137-6-R1. T ~ 332 °C.
R13	137-7-R1	50818	05/04 05 03	6954, 10633	April/May 05	2623	298	14.1	Active sulfide chimney/ Grab	Meg Tivey	White beehive texture, fine-grained Zn(?) sulfide w/ anhydrite. No flow from beehive spire. Near Marker 5.
B7	137-7-B1	50849	05/04 05 23	6953, 10632	April/May 05	2623	314	14.1	Shrimp, scale-worms/slurp	Stacy Kim	Side of larger ~ m tall sulfide w/ microbial mat surface staining.
	137-misc	(?)	05/04	(?)	April/May 05				Pillow basalt/grab	Meg Tivey	Miscellaneous pillow basalt from unknown location during dive 137.



Kilo Moana Vent Field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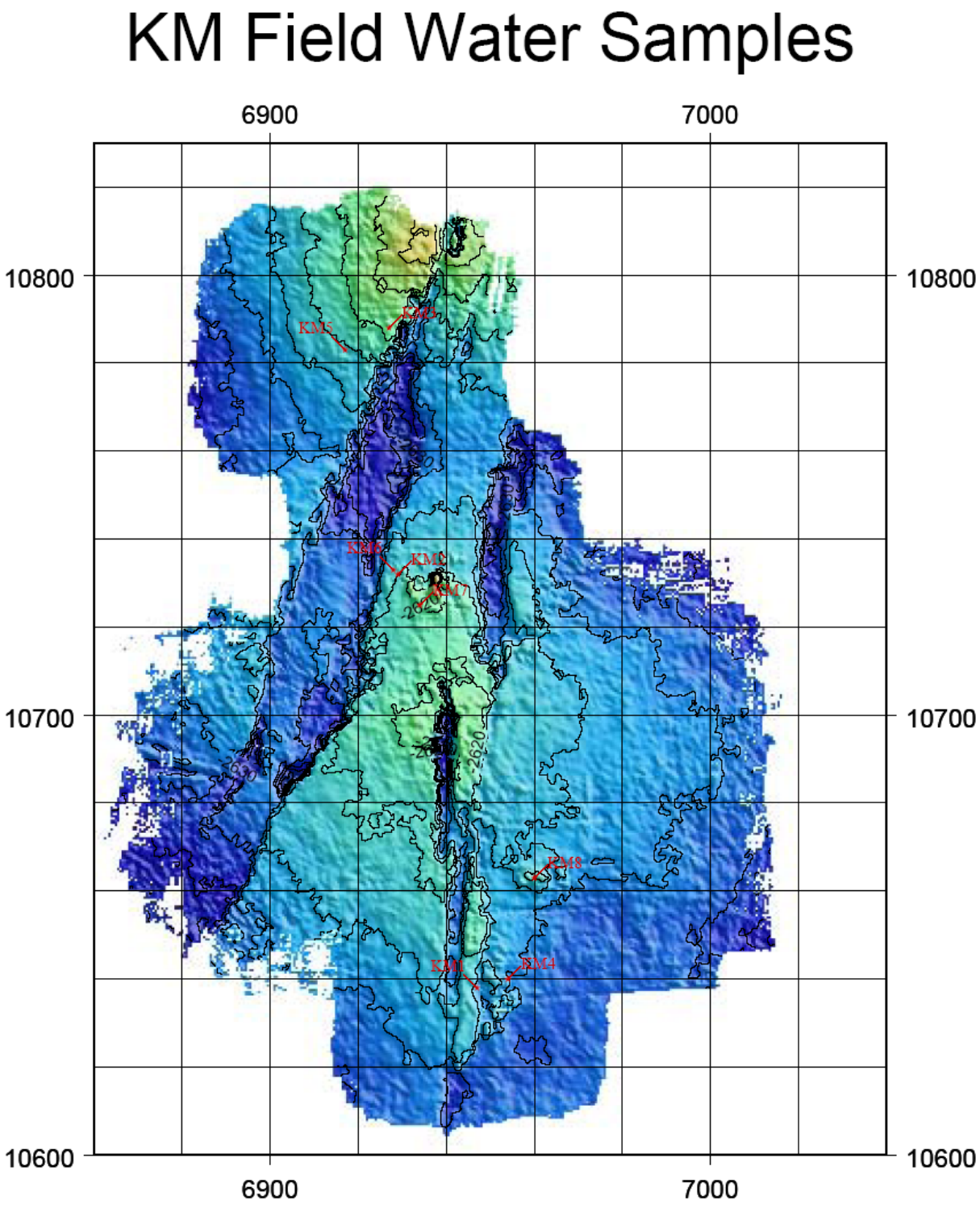
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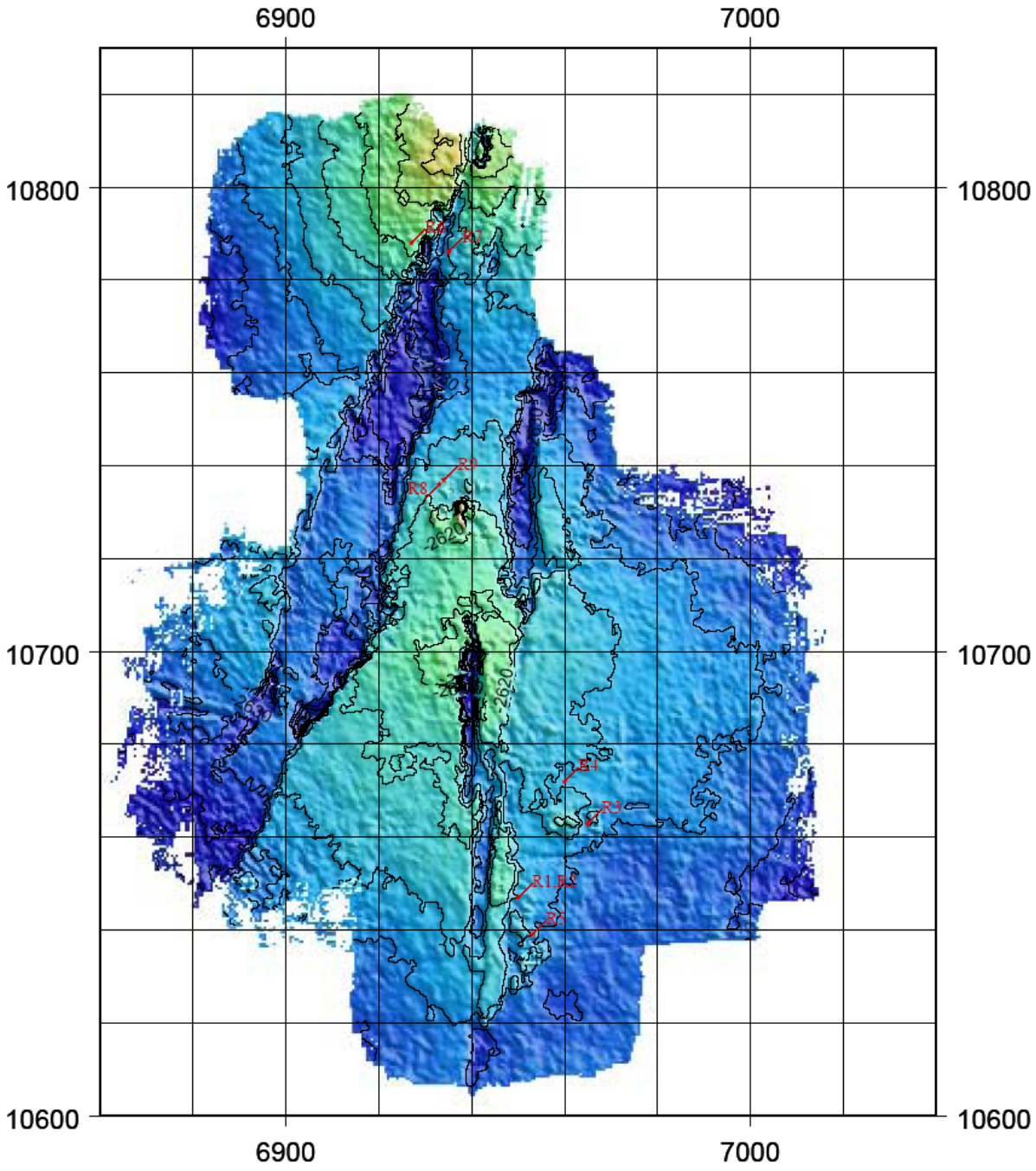
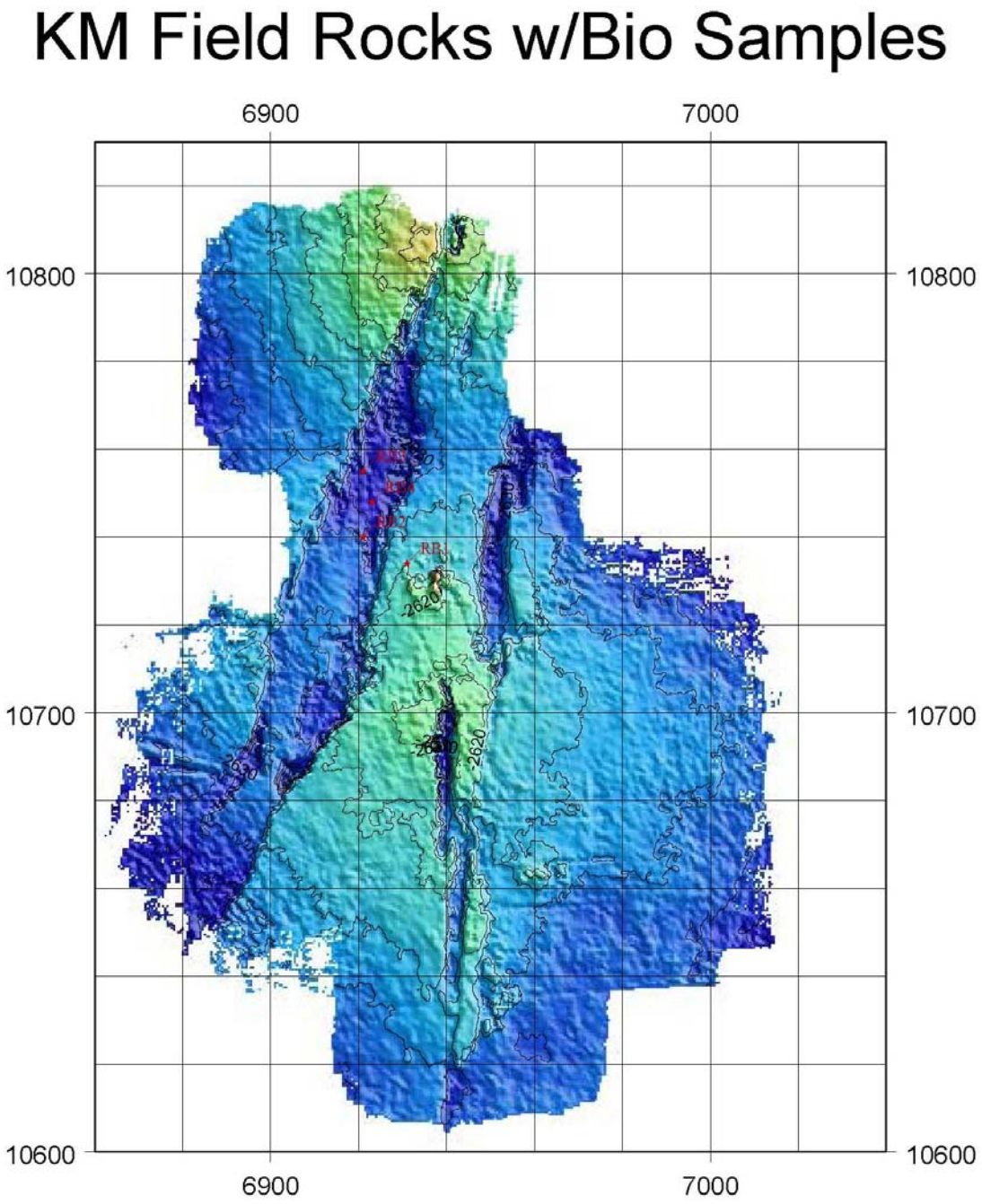
KM8
2620

KM Field Rock Samples

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RBJ
RBJ
RBJ
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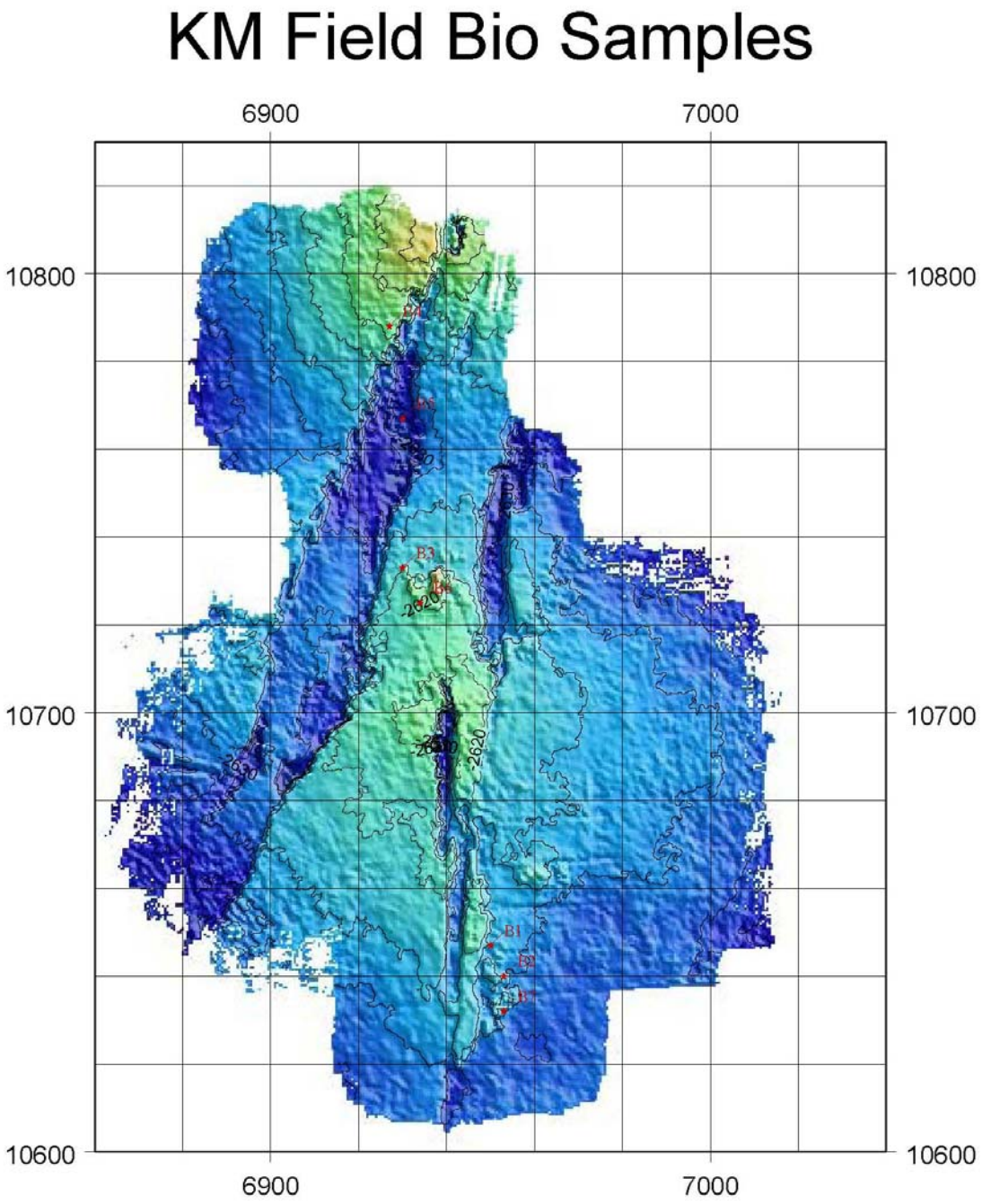
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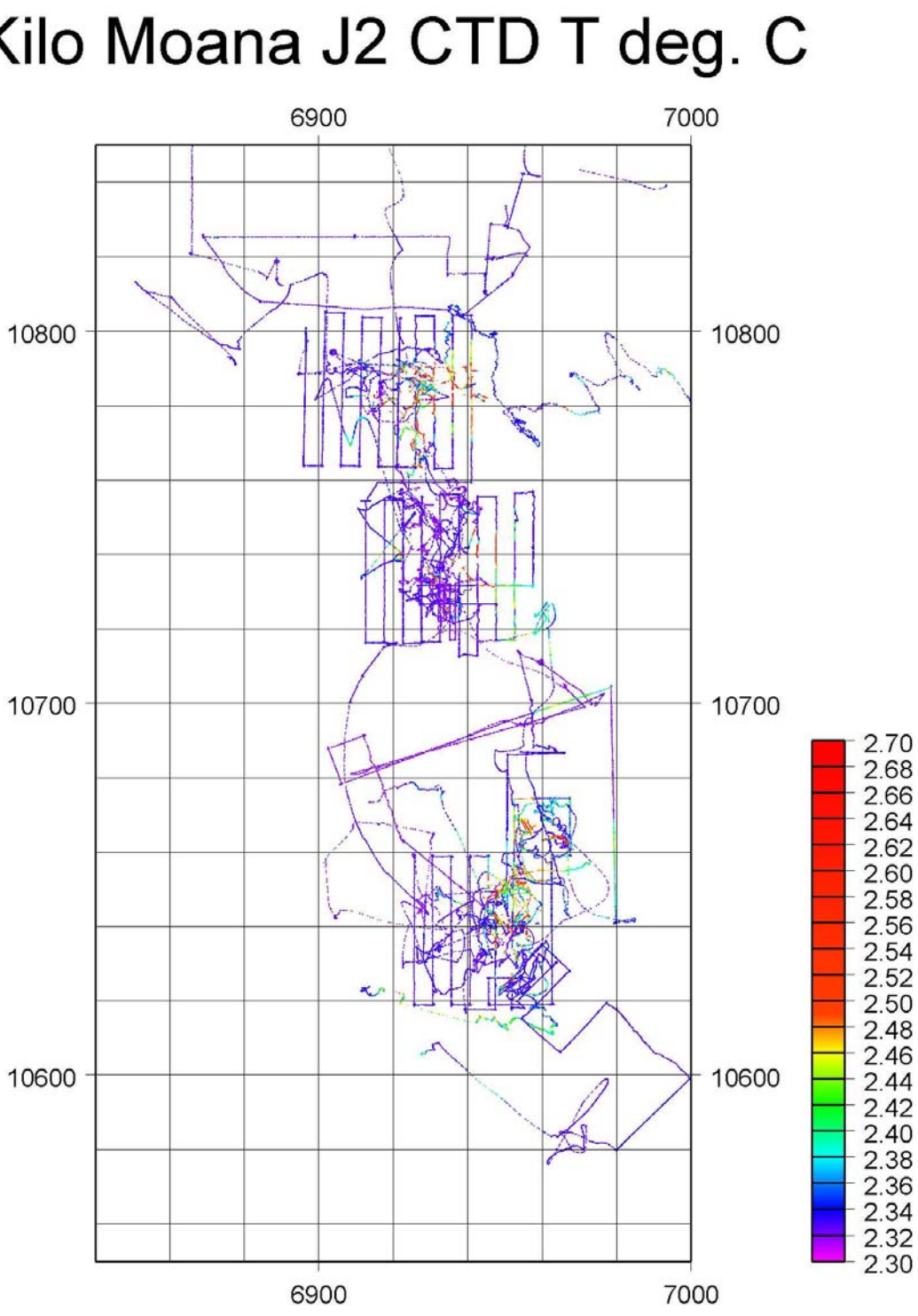
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2.48
2.46
2.44
2.42
2.40
2.38
2.36
2.34
2.32
2.30

Samples recovered from TowCam vent field on TUIM05MV, April-May 2005 (Lat/lon origin-20 -22.000 -176 -12.00)

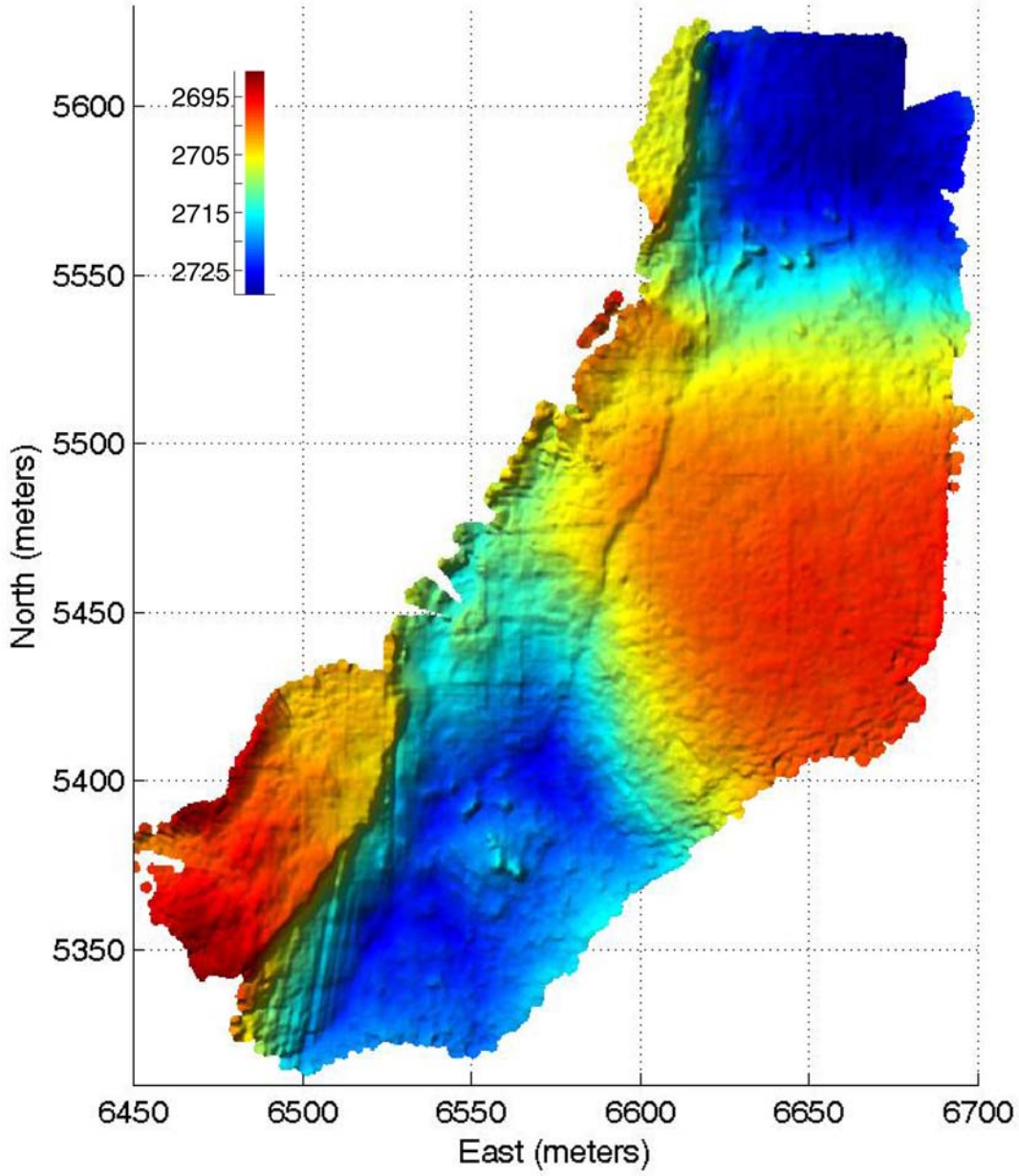
ID#	Sample Number J2-	VV Event #	Date/ Time (UTC)	Position X,Y	Nav version	Vehicle depth (m)	Vehicle hdg	Vehicle altitude (m)	Sample Type/ collection method	Contact person	Comments
TC1	126-1-W1-IGT2	9372	04/09 12 49	6651, 5560	April/May 05	2703.151	150.41	14.902	IGT2 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Active high temp smoker from fragile chimney. Tmax ~ 325 °C.
TC1	126-1-W2-IGT3	9454	04/09 12 58	6651, 5560	April/May 05	2703.178	150.68	7.038	IGT3 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. Temp 325 °C.
R1	126-1-R1	9490	04/09 13 09	6651, 5560	April/May 05	2703.131	150.33	15.54	Active sulfide chimney/ grab	Meg Tivey	Black/grey sulfide w/ multiple growth sequences?. Relict wall w/ later growth and anhy. veining? Pair for TC1 fluids.
M8	Mkr 8	9521	04/09 13 20	6649, 5564	April/May 05	2717.334	177.06	2.813	Marker 8		Base of ~ 2 m tall chimney, active flow at top. White microbial mat.
RB1	126-2-B1	9846, 9974	04/09 15 39	6654, 5542	April/May 05	2713.122	71.22	1.163	Brittle Star w/ pillow basalt. /grab	Stacy Kim	Glassy basalt from base of chimney. Fe-oxide staining on exterior of sample.
RB2	126-2-B2	10005 -	04/09 16 12	6654, 5542	April/May 05	2708.931	140.39	2.763	Anemone w/ pillow basalt/ grab	Stacy Kim	Glassy basalt w/ ~ 2 cm thick brown oxide staining. Broken surfaces have Fe±Mn oxide staining.
RB3	126-2-B3	10024 - 10091	04/09 16 27	6654, 5542	April/May 05	2708.775	129.29	2.863	Small anemones w/ pillow basalt/ grab.	Stacy Kim	Basaltic glass – as above.
B1	126-3-B1	10206	04/09 17 12	6614, 5538.	April/May 05	2703.962	109.47	1.313	Tube-worms/ grab	Stacy Kim	White "spaghetti" tubeworms from diffuse (?) flow sulfide mound.

B2	126-3-B2	10251	04/09 17 25	6614, 5538.	April/May 05	2704.26	108.88	1.125	*Alvinicon cha* Snails/ grab	Stacy Kim	Snails from same location as tubeworms. Diffuse flow sulfide mound.
TC2	126-3-W1-IGT4	10325	04/09 17 51	6614, 5538.	April/May 05	2704.341	110.15	1.238	IGT4 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Low T, diffuse flow from cracks in sulfide mound. T ~ 24°C.
TC2	126-3-W2-IGT8	10385	04/09 18 13	6614, 5538.	April/May 05	2704.253	108.83	1.463	IGT8 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. T ~ 24°C (max).
M9	Mkr 9	10469 11831	04/09 18 37 2208	6629, 5549 6617, 5550	April/May 05	2704.199 2704	116.1 120	0.938 2	Marker 9		Benchmark for low T diffuse flow site.
R2	126-4-R1	10547	04/09 19 06	6629, 5554	April/May 05	2706.152	238.18	0.775	Pillow Basalt /grab	Meg Tivey	Glassy basalt w/ advanced Fe/Mn oxide formation on exterior faces. Biological coating?
TC3	126-5-W1-IGT7	11030 – 11161	04/09 20 40	6651, 5533	April/May 05	2707.004	201.86	1.55	IGT7 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	High T, grey smoker from base of small discrete sulfide chimneys. T ~ 318 °C. T (exterior) ~ 19 °C.
R3	126-5-R1	11265	04/09 20 57	6651, 5533	April/May 05	2706.984	203.14	1.45	Active sulfide chimney/ grab	Meg Tivey	Dense black/brown sulfide grading into interior dendritic cpy/sph zone. Pair to fluid 126-5-W1 (TC3).
M7	Mkr 7	12372	04/09 23 30	6651, 5533	April/May 05	2703	239	3.9	Marker 7		~ 1 m to periphery of sampled spire.
R4	126-5-R2	11597	04/09 21 17	6651, 5533	April/May 05	2706.666	149.58	2.938	Inactive sulfide chimney/ grab	Meg Tivey	Dendritic Zn-rich (?) textured sulfide w/ sph or cpy lined conduits. Thick (~ 2 mm) exterior Fe-oxide coating.
RB4	126-5-B1	11623	04/09 21 20	6651, 5533	April/May 05	2706.409	139.05	3.863	Barnacles (w/ relict sulfide) /grab	Stacy Kim	Composition/Texture of sulfide similar to 126-5-R2.

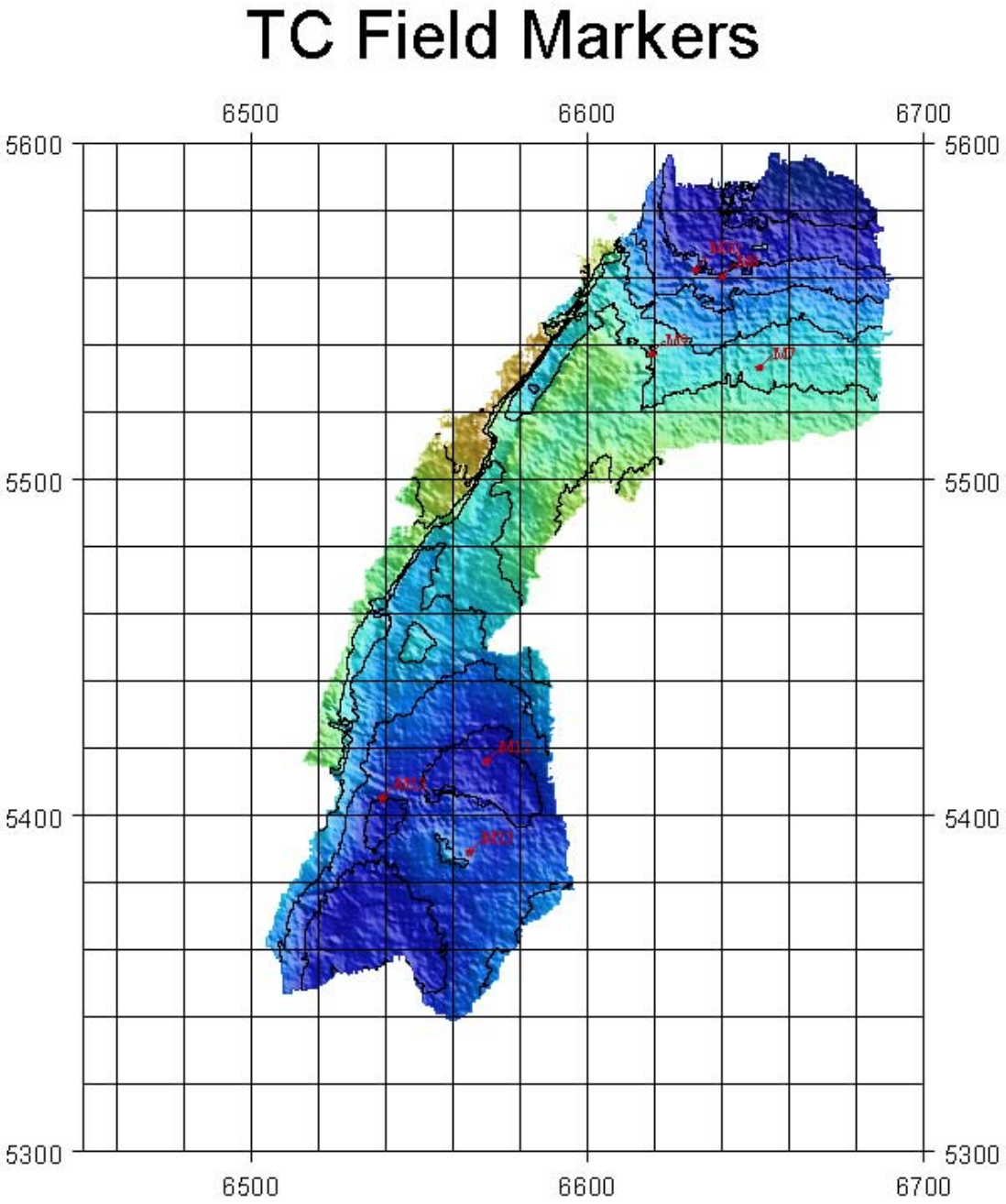
TC3	126-6-W1-IGT6	11962 – 12018	04/09 22 30	6627, 5564	April/May 05	2710.324	38.62	1.625	IGT6 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Several m tall BS chimney complex. Fluid from cpy-lined orifice T~ 314 °C. No sulfide pair.
B3	126 -7-B1	12129	04/09 22 49	6625, 5565	April/May 05	2710.648	109.46	5.051	Gastropod (w/ small sulfide piece) /grab	Stacy Kim	Gastropods (sp?) from chimney surfaces from which BS/GS fluid discharging.
M10	Mkr 10	12316	04/09 23 12	6632, 5562	April/May 05	2714.623	99.79	0.738	Marker 10		Placed on pillow basalt flow, near to snail and barnacle community.
M11	Mkr 11	13049	04/10 04 35	6570, 5416	April/May 05	2718.415	200.47	14.614	Marker 11		Base of small sulfide mound, low T flow.
M12	Mkr 12	13166	04/10 05 04	6539, 5404	April/May 05	2714.251	265.2	14.614	Marker 12		Low lying sulfide mound w/ ~ 1 m tall discrete chimneys. Bacterial mat in fissures in basalt.
TC4	127-1-W1-IGT1	13930	04/11 03 05	6539, 5404	April/May 05	2714.38	329.06	2.075	IGT1 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	High T, black smoker orifice from small active spire. Tmax 300 °C
TC4	127-1-W1-IGT2	13980	04/11 03 15	6539, 5404	April/May 05	2714.292	329.76	2.038	IGT2 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. T ~ 303 °C.
R5	127-1-R1	14055	04/11 03 45	6539, 5404	April/May 05	2714.184	342.04	2.25	Active sulfide chimney/ grab	Meg Tivey	White smoker, dark grey Fe-Zn rich sulfide. White oxide coating. Base of spire of more focused flow.
R6	127-1-R2	14125	04/11 04 13	6539, 5405	April/May 05	2715.001	312.66	2.075	Active sulfide chimney/ grab	Meg Tivey	cpy±sph rich (?) sulfide lining of Fe-Zn rich chimney. Proximal to TC5.
TC5	127-2-W1-MGreen	14468	04/11 06 38	6651, 5533	April/May 05	2706.998	216.93	10.001	Major Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Complement to sulfide 126-5-R1 (R3) and fluid 126-5-W1-IGT7 (TC3).

TC5	127-2-W2-Mred	14529	04/11 06 54	6651, 5533	April/May 05	2707.018	216.8	10.001	Major Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate major water sample, from same orifice (marker 7 site).
B4	127-2-B1	14607	04/11 07 22	6652, 5533	April/May 05	2707.004	156.5	10.001	Mussels/ grab	Stacy Kim	Side of (relict? Inactive?) sulfide mound ~ 1 m from black smoker chimneys.
R7	127-3-R1	14950	04/11 09 24	6567, 5401	April/May 05	2721.052	283.91	10.001	Relict sulfide chimney/ grab	Meg Tivey	Mixed fine-grained green/grey w/ intermixed cpy/sph (?). Fe-oxide coating on interior.
R8	127-4-R1	15282 - 15387	04/11 10 00	6579, 5409	April/May 05	2719.977	9.91	10.001	Active sulfide chimney/ grab	Meg Tivey	Mixed Fe-Zn and Fe-Cu sulfide w/ massive anhydrite (veins?).
TC6	127-4-W1-IGT6	15522	04/11 10 18	6580, 5409	April/May 05	2719.869	8.13	10.001	IGT6 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Focused, high T grey smoker. T ~ 287 °C. Complement to sulfide 127-4-R1.
TC6	127-4-W2-IGT5	15642	04/11 11 08	6580, 5409	April/May 05	2719.551	11.35	10.001	IGT5 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample. Same orifice. T ~ 265°C.
R9	127-5-R1	15700	04/11 11 30	6564, 5423	April/May 05	2719.274	302.37	10.001	Active sulfide chimney/ grab	Meg Tivey	Grey/White smoker. Beehive texture, green/grey sulfide w/ sph (?). Anhydrite lining conduits? T ~ 182 °C.
B5	127-5-B1	15712	04/11 11 31	6564, 5423	April/May 05	2719.145	301.25	10.001	Cucumber /Worm/ grab	Stacy Kim	Volunteer worm *Synaptid* or *Remertian*?
B6	127-6-B1	15783	04/11 12 14	6565, 5389	April/May 05	2715.833	184.54	1.725	Seastars/ grab	Stacy Kim	On inactive (large) sulfide mounds. Significant population of seastars.
M13	Mkr 13	15871	04/11 12 29	6565, 5389	April/May 05	2716.279	182.77	1.638	Marker 13		At base of large mound where seastars collected. South of markers 11 and 12.
B7	127-6-B2	15911	04/11 12 41	6565, 5389	April/May 05	2716.036	178.73	1.913	Snails/ grab	Stacy Kim	Several *Provannid* (?) snails sampled from base of inactive sulfide mound.

B8	127-6-B3	16215	04/11 14 40	6562, 5386	April/May 05	2715.711	194.1	1.95	Egg cases/grab	Stacy Kim	Bivalve egg cases (species?), secured to basalt substrate.
B9	127-7-B1	16167	04/11 14 15	6559, 5374	April/May 05	2715.299	13.7	1.263	Snails/ grab	Stacy Kim	*Ifremeria* from basalt (?) substrate.
R10	139-1-R1	53444	05/05 23 01	6543, 5400	April/May 05	2713.061	320.71	4.388	Active sulfide chimney/ grab	Meg Tivey	Layered chimney wall, 6 – 10 cm diam. Inner green/grey friable sulfide w/ thin outer cohesive (cpy±sph?) rich casing
K1	139-Toaster1	53541	05/05 23 40	6540, 5405	April/May 05	2713.528	298.91	4.451	Toaster (Kadko)	Dave Kadko	For Radon measurements. In plume of active vents at Marker 12.
K2	139-Toaster 2	53622	05/06 00 17	6568, 5413	April/May 05	2717.807	339.82	2.725	Toaster (Kadko)	Dave Kadko	For Radon measurements. In plume of active vents at Marker 11.
R11	139-2-R1	54211	05/06 04 12	6637, 5549	April/May 05	2708.093	99.07	8.951	Active sulfide chimney/ grab	Meg Tivey	Chimney fragments from spire. Friable interior, cohesive crust w/ oxide/silicate coating? No fluid pair
TC7	139-2-W1-IGT5	54248	05/06 04 42	6637, 5549	April/May 05	2708.147	100.16	9.114	IGT5 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Focused, high T fluid sample from top of complex. T ~ 308 °C. Not a pair.
TC7	139-2-W2-IGT6	54323	05/06 05 04	6637, 5549	April/May 05	2708.167	100.61	9.026	IGT6 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. No temp data.
R12	139-2-R2		05/06	6637, 5549	April/May 05				Active sulfide chimney/ grab	Meg Tivey	Large active sulfide. Cpy-rich and Anhy-rich? Volunteer, possible fluid pair.
B10	139-3-B1	54475	05/06 06 02	6614, 5537	April/May 05	1.663	1.663	1.663	Anemone/ grab	Stacy Kim	Base of sulfide mound of diffuse, low T flow



Tow Cam Vent Field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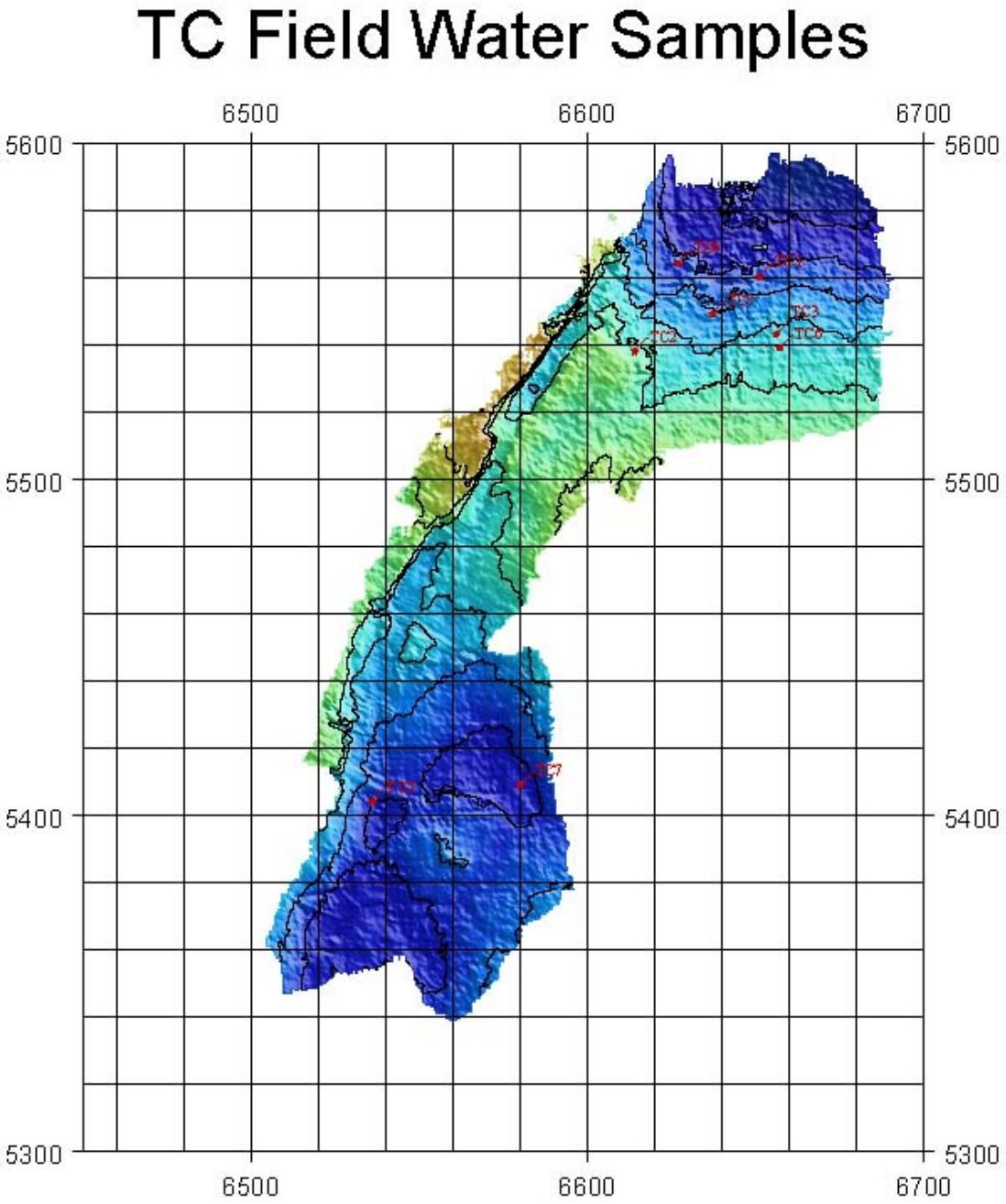
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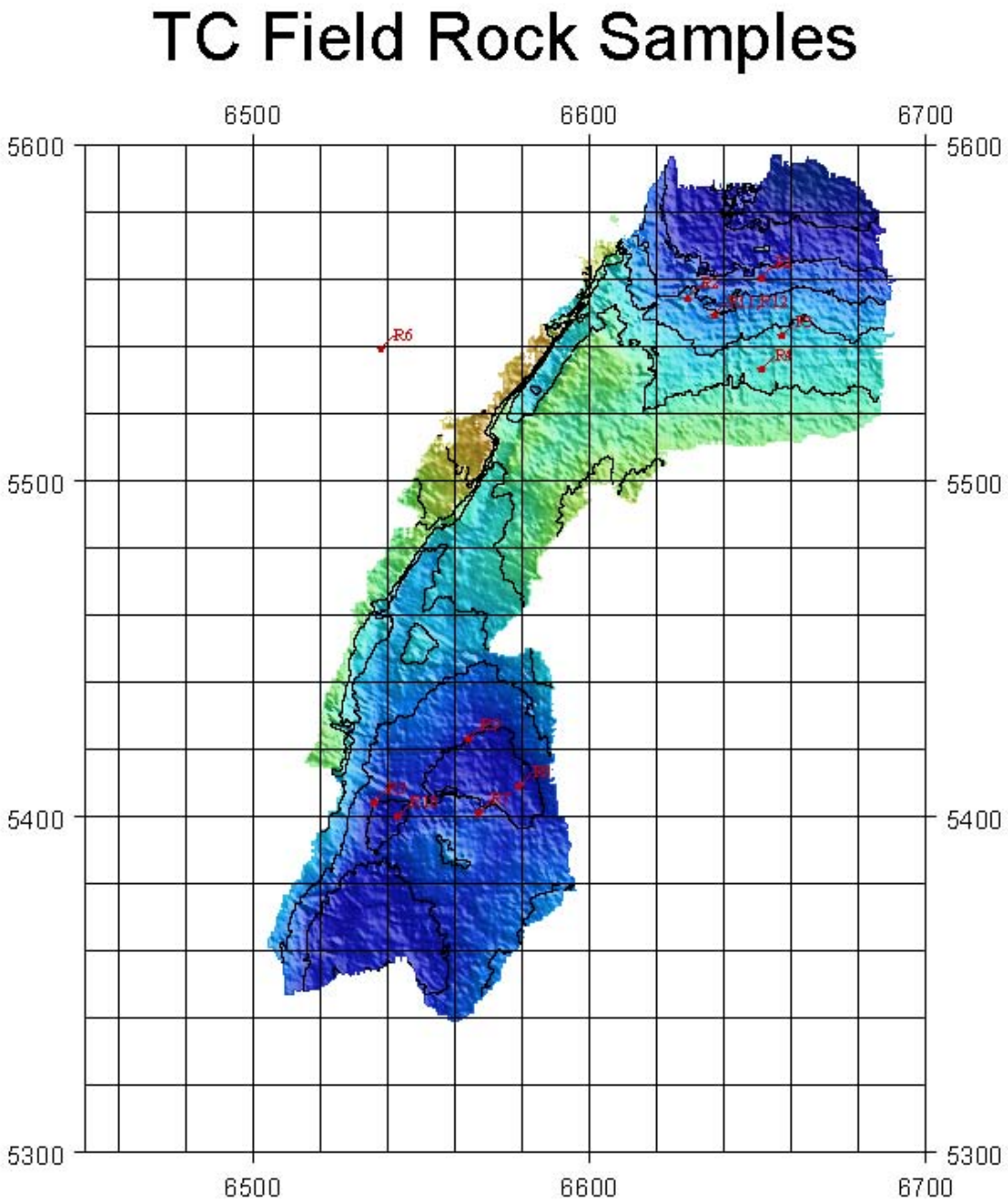
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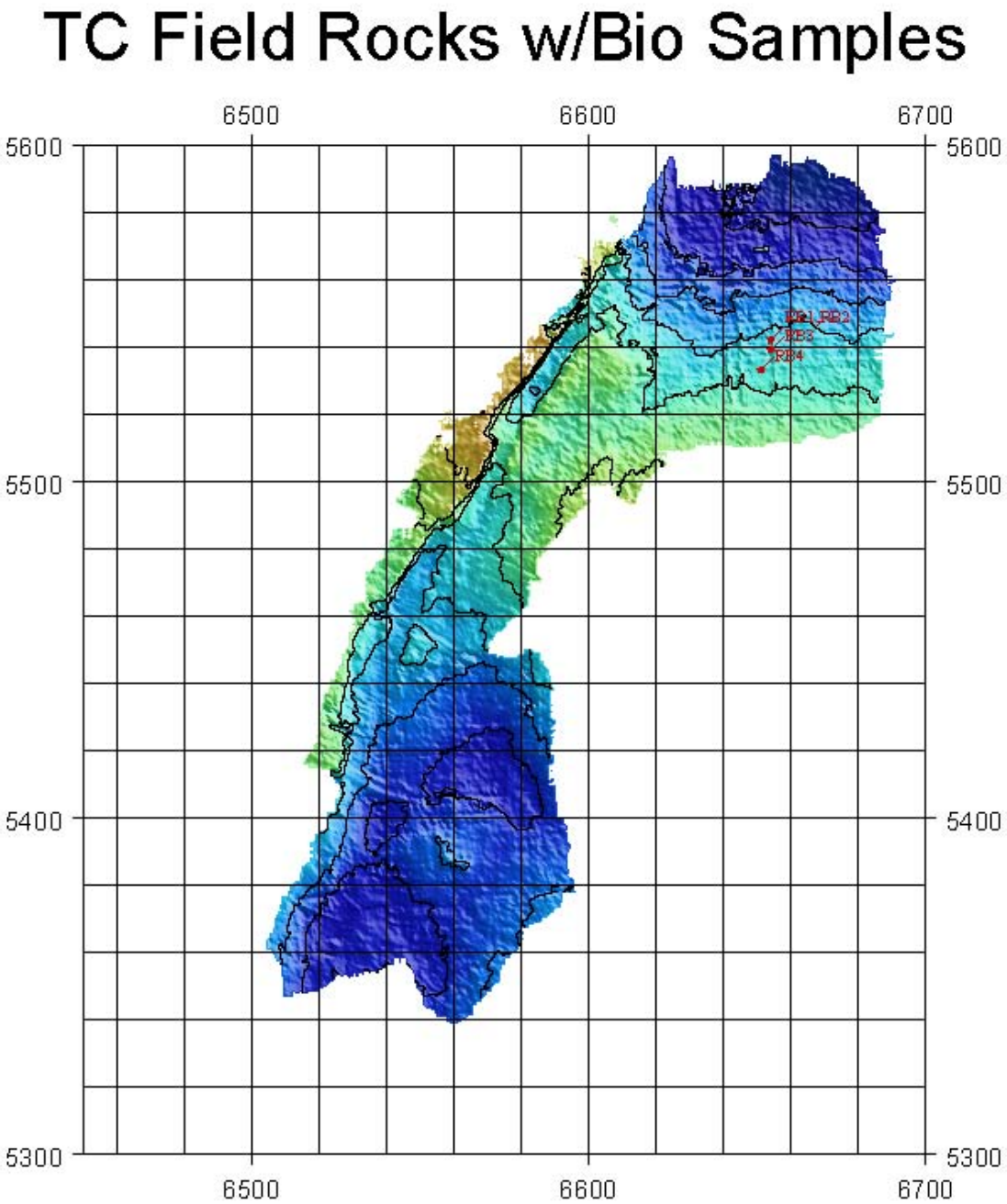
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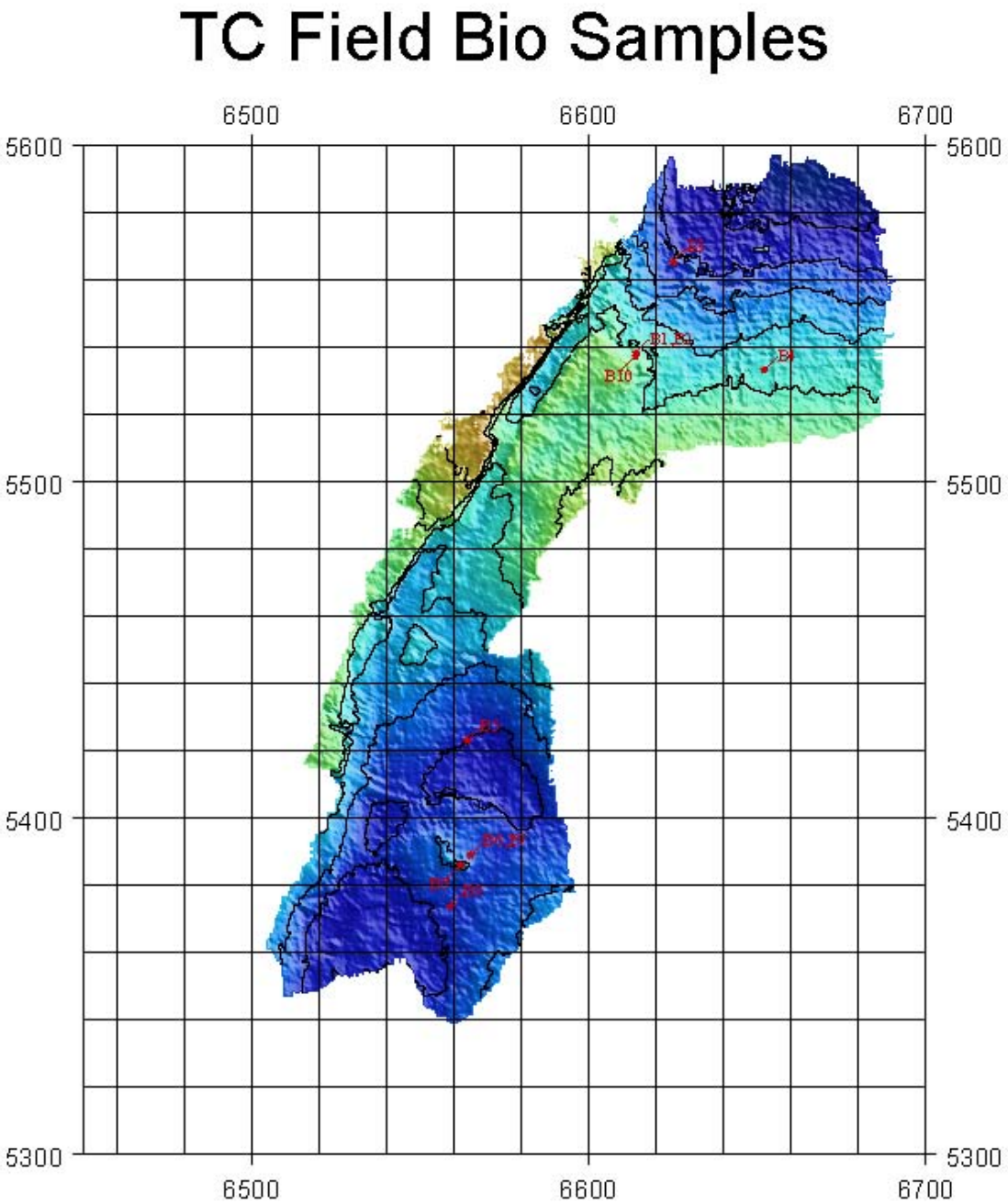
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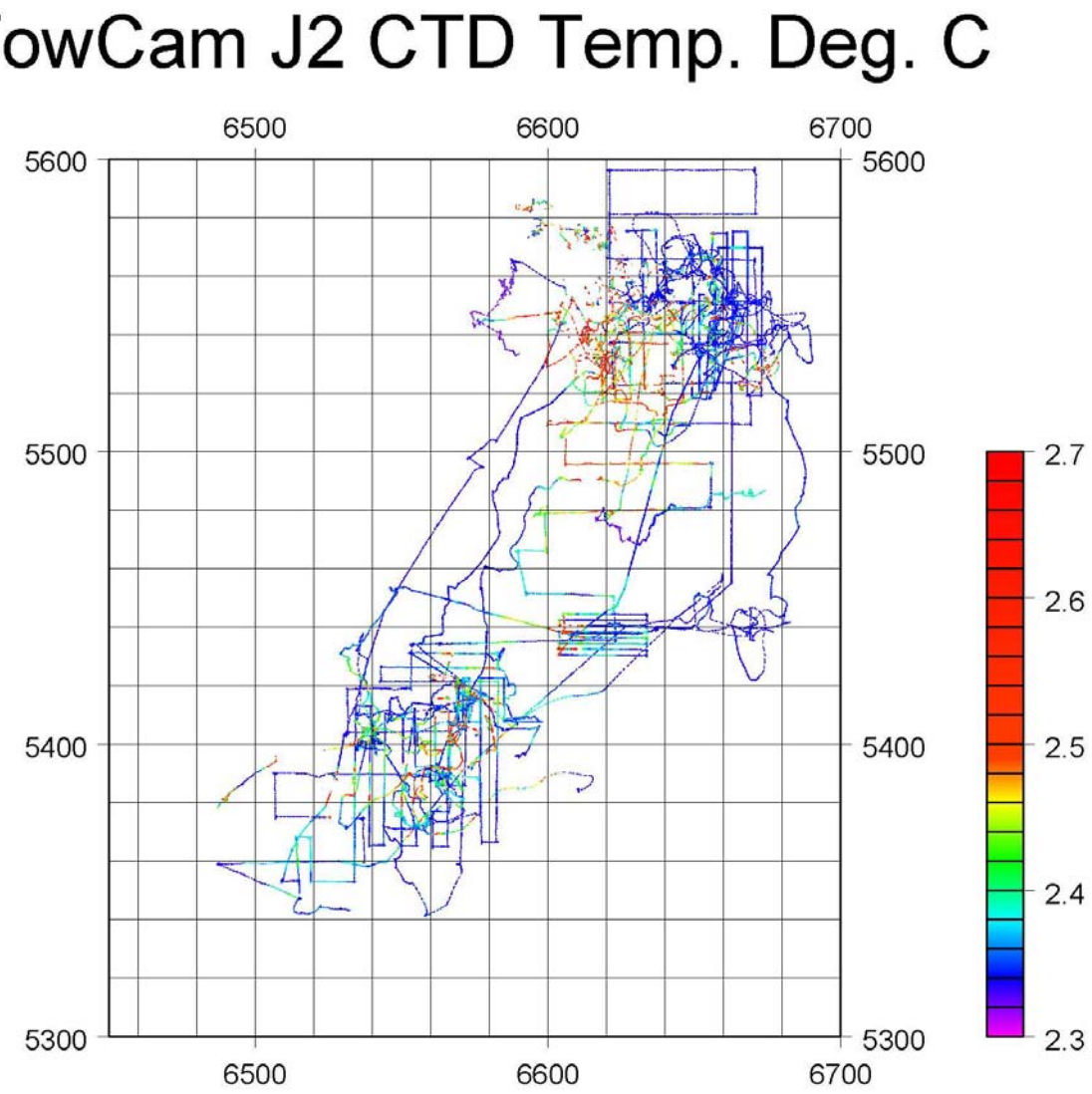
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Samples recovered from the ABE vent fields on TUIM05MV, April-May 2005 (Lat/lon origin-20 -50.00 -176 -16.00)

ID#	Sample Number J2-	VV Event #	Date/ Time	Position (X,Y)	Nav version #	Vehicle depth (m)	Vehicle hdg	Vehicle altitude (m)	Sample Type/ collection method	Contact person	Comments
R1	128-1-R1	17745	04/13 07 02	7925, 7958	April-May 05	2144.684	297.12	2.838	Andesite/ grab	Meg Tivey	Piece of andesite from highly fissured volcanic tabular flow
R2	128-1-R2	17837	04/13 07 11	7925, 7958	April-May 05	2144.691	323.61	2.838	Relict sulfide/ grab	Meg Tivey	Sample of relict sulfide spire from small chimney complex. Empty mussel shells around spires.
M18	Mkr18	19159	04/13 10 19	7931, 7945	April-May 05	2142.163	203.6	2.838	Marker 18		Active (> 1 m diameter) flange structure with diffuse flow.
R3	128-2-R1	19240	04/13 10 23	7931, 7945	April-May 05	2142.088	184.41	2.838	Active sulfide flange/ grab	Meg Tivey	Edge piece of flange. Largely dendritic light-grey sulfide w/ white upper surface coating. T ~ 137–141 °C.
A1	128-3-W1-IGT8	19890	04/13 11 42	7894, 8015	April-May 05	2140.183	238.02	2.838	IGT8 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	From top of active *spire*, w/ white patchy coating. Tmax 325 °C
A1	128-3-W2-IGT7	19905	04/13 11 50	7894, 8015	April-May 05	2140.156	238.2	2.838	IGT7 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample, same orifice. Temp 312.6 °C. No sulfide pair?
M19	Mkr 19	19947	04/13 11 59	7894, 8015 (2140m, 238)	April-May 05	2140.17	256.56	2.838	Marker 19		Locus of sampling here. Two major active chimneys (one mound, one spire)
R4	128-3-R1	20014	04/13 12 32	7894, 8015	April-May 05	2139.845	254.21	2.838	Active sulfide chimney/ grab	Meg Tivey	3 or 4 pieces from sulfide *mound*. Fine-grained Fe/Zn (?) sulfide w/ anhydrite matrix and cpy (?) conduit lining

A2	128-3-W3-Mred	20054	04/13 12 37	7894, 8015	April-May 05	2139.912	250.6	2.838	Major water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Complement to chimney sample 128-3-R1 from sulfide *mound*. No temp data.
A2	128-3-W4-Mgreen	20084	04/13 12 46	7894, 8015	April-May 05	2139.838	250.71	2.838	Major water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate water sample from same orifice. No T data.
B1	128-3-B1	20134	04/13 13 09	7894, 8015	April-May 05	2139.804	242.85	2.838	Shrimp/ slurp	Stacy Kim	Shrimp in proximity to active vent of sulfide mound.
B2	128-3-B2	20193	04/13 13 24	7894, 8015	April-May 05	2140.292	224.55	2.838	Mussels/grab	Stacy Kim	*Bathymodiolus* (?) mussels at base of high T, focused vent chimney
B3	128-4-B1	20284	04/13 13 58	7872, 8018	April-May 05	2131.968	264.2	4.388	Mussels /grab	Stacy Kim	Mussels living on andesitic basement, with diffuse flow through fissures.
M15	Mkr 15	20319	04/13 14 03	7873, 8017	April-May 05	2132	249	3	Marker 15		Fissured basement, small spires, mussels.
RB1	128-4-B2	20337	04/13 14 14	7873, 8017	April-May 05	2132.87	246.69	2.163	Bivalve (w/ andesite) /grab	Stacy Kim	Mussels collected from volcanic lavas. Possible *Gorgonia* coral?
A3	128-4-W1-IGT3	20355	04/13 14 21	7872, 8017	April-May 05	2132.05	251.99	2.575	IGT3 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse flow from mussel patch. T ~ 12°C (stable)
A3	128-4-W2-IGT4	20403	04/13 14 38	7872, 8017	April-May 05	2132.287	256.16	2.288	IGT4 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample. Same flow region. T ~ 11.7 °C
B4	128-4-B3	20500	04/13 15 10	7872, 8015	April-May 05	2131.778	310.88	4.951	Crabs/ slurp	Stacy Kim	From diffuse flow area. Two possible species incl. *Galatheid* (?) crabs.

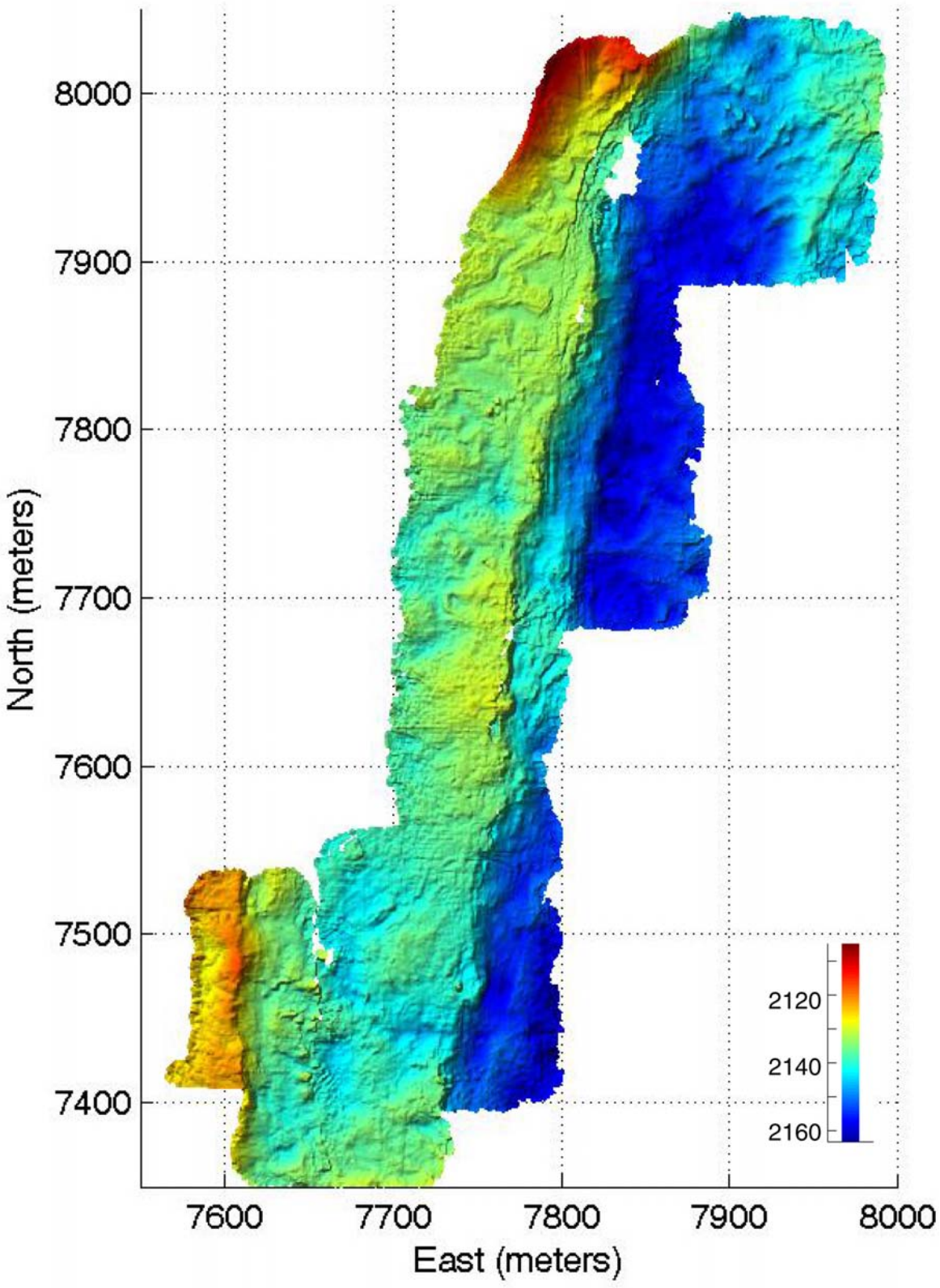
RB2	128-4-B4	20587	04/13 15 55	7870, 8014	April-May 05	2132.592	312.69	4.126	Barnacles (w/ andesite) /grab	Stacy Kim	Edge of diffuse flow area, attached to andesite
RB3	128-4-B5	20603	04/13 16 05	7870, 8014	April-May 05	2132.605	311.4	3.738	Anemone (w/ andesite) /grab	Stacy Kim	Plus barnacles. From brecciated andesite (or sulfide?)
R5	128-5-R1	20666	04/13 16 33	7896, 8005	April-May 05	2138.997	61.31	3.088	Active sulfide chimney/ grab	Meg Tivey	Friable, beehive texture sulfide chimney w/ white (microbial) coating.
R6	128-5-R2	20687	04/13 16 40	7895, 8005	April-May 05	2139.004	61.82	3.088	Active sulfide chimney/ grab	Meg Tivey	Base of spire of upper chimney sample 128-5-R1. At base of black smoker complex.
B5	128-6-B1	20794	04/13 17 21	7906, 7998	April-May 05	2139.126	11.47	4.326	Snails/ grab	Stacy Kim	*Ifremeria* (?) snails on periphery of sulfide mound w/ black smoker flow.
R7	128-7-R1	21016	04/13 18 49	7831, 7797	April-May 05	2146.839	281.9	5.251	Andesite/ grab	Meg Tivey	Flow of jagged volcanic lava from vertical wall/outcrop.
R8	128-8-R1	21451	04/13 20 37	7850, 7783	April-May 05	2152.77	220.07	1.538	Active sulfide chimney/ grab	Meg Tivey	From cluster of small, active chimneys T(int) ~ 210 °C; T(ext) ~ 12 °C
R9	128-8-R2	21652	04/13 20 57	7850, 7783	April-May 05	2153.455	333.37	0.925	Inactive sulfide chimney/ grab	Meg Tivey	Inactive spire from edge of complex. Exterior has Fe-oxide staining.
M16	Mkr 16	21640	04/13 20 57	7850, 7783	April-May 05	2154.071	227.49	1.663	Marker 16		Center of sulfide chimney complex.
M17	Mkr 17	21718	04/13 21 14	7826, 7751	April-May 05	2145.24	209.04	5.201	Marker 17		Base of complex of small chimneys, some minor activity.

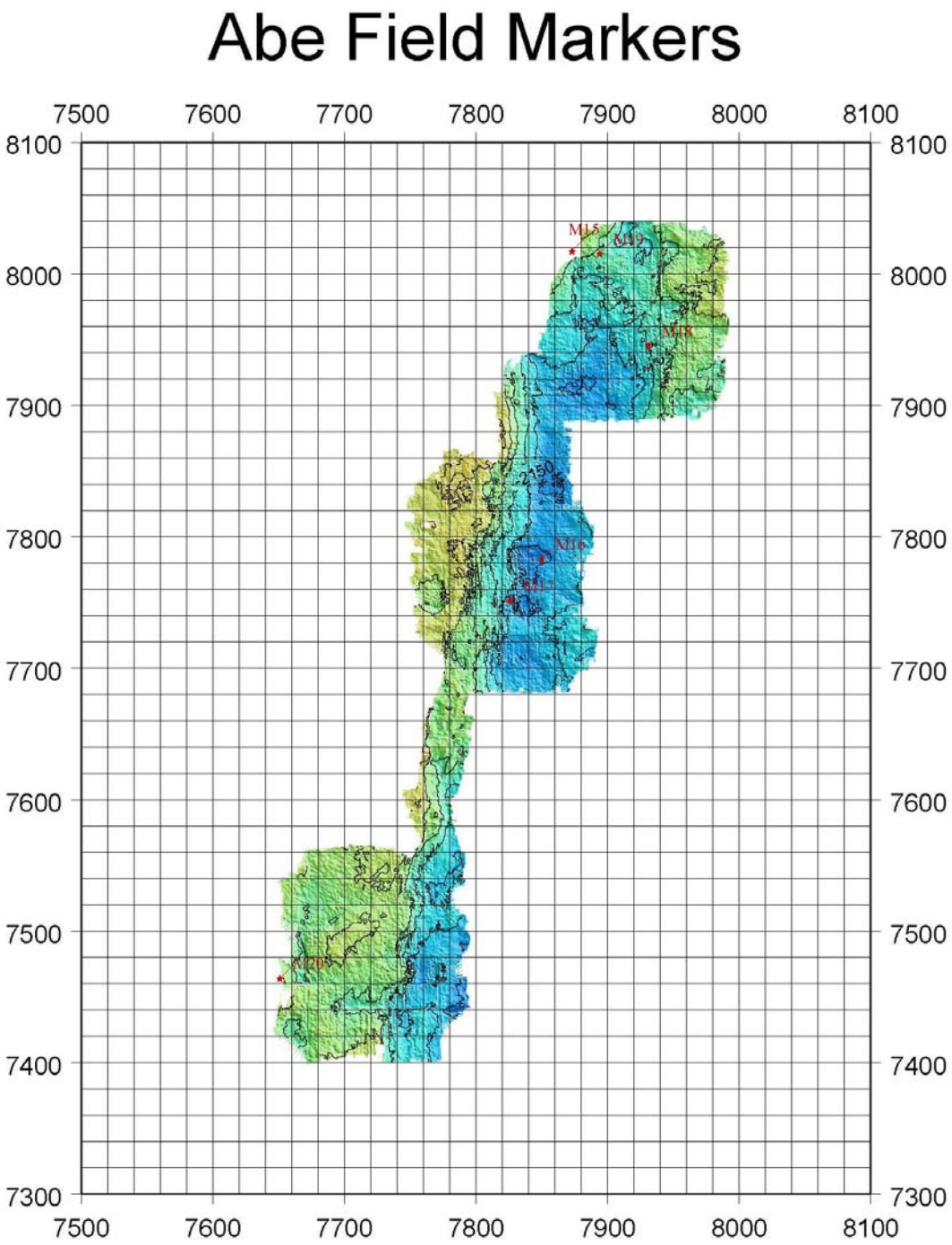
R10	129-1-R1	22650	04/14 10 16	7652, 7461	April-May 05	2131.189	46.17	6.351	Active sulfide chimney/ grab	Meg Tivey	Friable Zn-sulfide?, beehive texture w/ anhydrite cementing. Sph lined conduit?
A4	129-1-W1-IGT3	22756	04/14 10 35	7652, 7461	April-May 05	2131.189	48.71	6.351	IGT3 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Focused white smoker chimney. Pair for sulfide 129-1-R1 (R10). T ~ 264 °C (variable T)
A4	129-1-W2-IGT4	22 811	04/14 10 55	7652, 7461	April-May 05	2131.446	56.26	6.351	IGT4 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate orifice, same sample. T ~ 302 °C.
M20	Mkr 20	22829	04/14 11 00	7652, 7461	April-May 05	2132.775	35.78	6.351	Marker 20		At base of smoker complex.
R11	129-1-R2	22861	04/14 11 08	7654, 7455	April-May 05	2135.025	101.73	6.351	Andesite/ grab	Meg Tivey	Base smoker complex. Ropey andesite ~ 10 m downhill from sulfide complex.
R12	129-1-R3	22908	04/14 11 22	7668, 7455	April-May 05	2134.91	235.3	6.351	Relict sulfide chimney/ grab	Meg Tivey	Relict sulfide from base of smoker complex.
B6	129-2-B1	23255	04/14 13 35	7714, 7412	April-May 05	2136.652	198.88	6.351	Crabs/slurp	Stacy Kim	*Galatheid* crabs collected on andesite using slurp gun.
R13	129-3-R1	23797-23807	04/14 17 31	7853, 7771	April-May 05	2151.997	354.64	2.363	Active sulfide chimney/ grab	Meg Tivey	Beehive white smoker spires from small chimney complex; near marker 16
A5	129-3-W1-IGT5	23913	04/14 18 12	7853, 7771	April-May 05	2152.736	146.36	2.85	IGT5 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Grey smoker. T ~ 288 °C. Fluid pair to sulfide 129-3-R1.
A5	129-3-W2-IGT6	23967	04/14 18 35	7853, 7771	April-May 05	2153.007	145.35	2.813	IGT6 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample, same orifice. No T data.

	Mkr 21	24361	04/14 20 00	7833, 7757	April-May 05	2148.941	314.02	2.613	Marker 21		Center of active, diffuse flow sulfide w/ large populations of mussels, snails.
R14	129-4-R1	24609	04/14 20 21	7827, 7756	April-May 05	2144.027	289.55	3.2	Andesite/ grab	Meg Tivey	Vesicular andesite w/ Mn-oxide coating and large protuberances. Periphery of flow regions.
A6	129-5-W1-IGT1	24823	04/14 20 53	7834, 7759	April-May 05	2149.191	276.69	4.038	IGT1 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse flow sample. Among *Ifremeria* snails. T~ 18 °C
A7	129-6-W1-IGT2	24970	04/14 21 23	7826, 7756	April-May 05	2147.043	303.87	2.938	IGT2 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse flow sample. Among *Alviniconcha* snails. T ~ 98 °C.
R15	136-2-R1	46671	05/02 06 05	7761, 7816	April-May 05	2125.271	187.62	4.776	Active sulfide chimney/ grab	Meg Tivey	Small pieces of sulfide from focused, black smoker orifice. Part of larger complex.
A8	136-2-W1-IGT5	46724	05/02 06 30	7761, 7816	April-May 05	2125.21	186.05	4.651	IGT5 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Fluid pair for sulfide 136-2-R1. T ~ 305 °C.
A1	136-3-W1-Mred	46998	05/02 08 14	7895, 8015	April-May 05	2139.411	243.58	2.5	Major fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample from sulfide mound, dive J2-128-3-W3/W4 (A2)
B7	136-4-B1	47930	05/02 14 07	7524, 6914	April-May 05	2152.14	48.39	0.975	Octo-coral/grab	Stacy Kim	On ropey andesitic basement. Particles in water column, but no evident flow.
R16	136-4-R1	47947	05/02 14 13	7254, 6914	April-May 05	2152.424	41.59	0.863	Andesite/ grab	Meg Tivey	Ropey, vesicular andesite, w/ Mn-oxide (?) coating.

A9	136-5-W1-IGT4	48385	05/02 16 55	7650, 7402	April-May 05	2132.138	286.35	2.888	IGT4 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Focused, high T black smoker flow. T ~ 300 °C. Nr marker 20.
A9	136-5-W2-IGT6	48424	05/02 17 05	7650, 7402	April-May 05	2132.111	286.3	2.863	IGT6 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. Bad thermocouple; no T data.
R17	136-5-R1	48525	05/02 17 40	7650, 7415	April-May 05	2128.26	234.39	6.401	Inactive sulfide chimney/ grab	Meg Tivey	Sulfide from same complex, but not a fluid-chimney pair. No flow evident.
B8	136-5-B1	48581	05/02 18 00	7650, 7402	April-May 05	2132.856	318.37	2.525	Sediment/ scoop	Stacy Kim	Sediment from scoop, near dead bivalves. Small sulfide fragments?
R18	136-6-R1	48856	05/02 19 55	7642, 7398	April-May 05	2134.131	40.44	4.601	Relict sulfide/ grab	Meg Tivey	From inactive chimney cluster. Black/grey colored sulfide w/ ~ 2 mm thick Fe/Mn oxide crust.

ABE Vent Field

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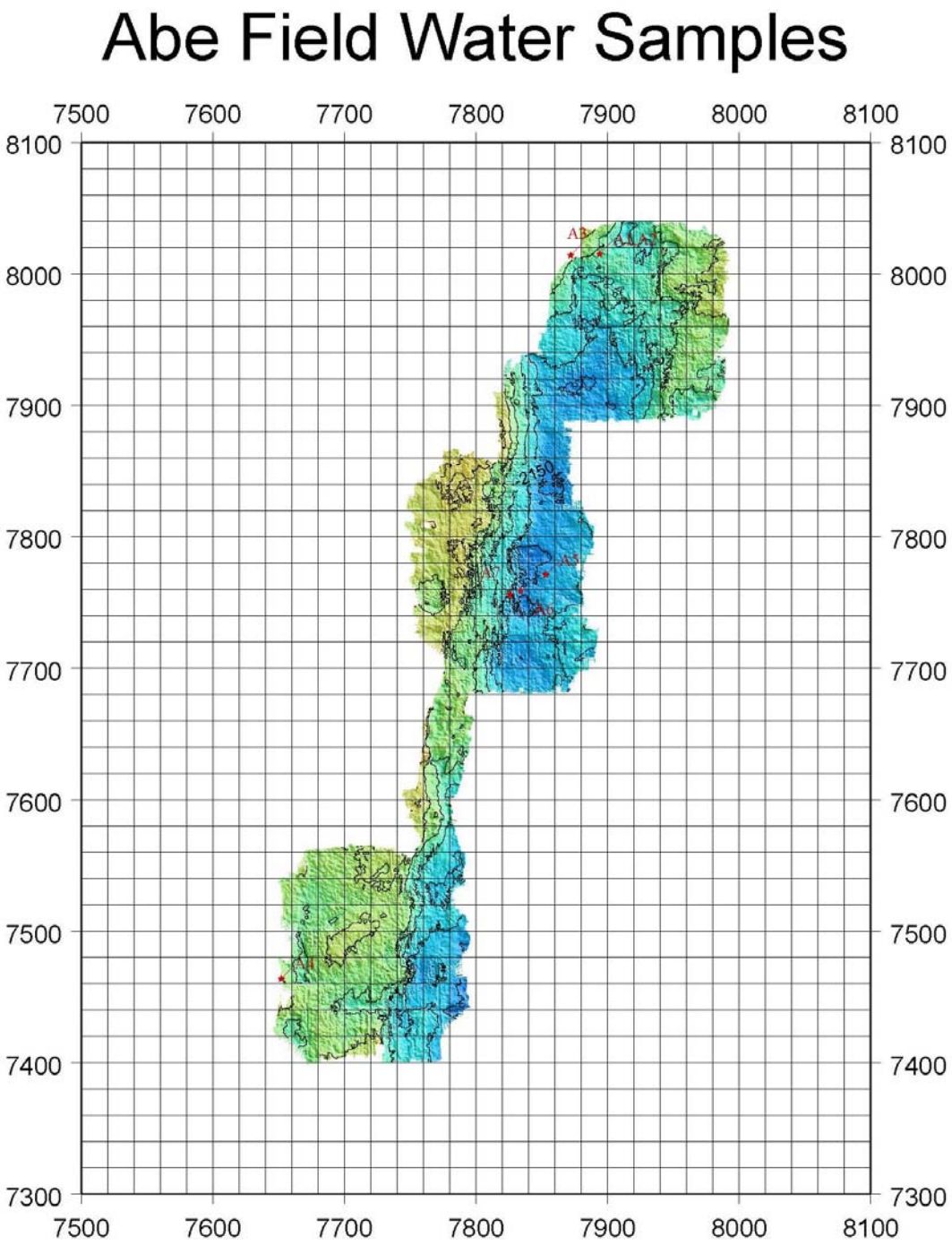
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A4
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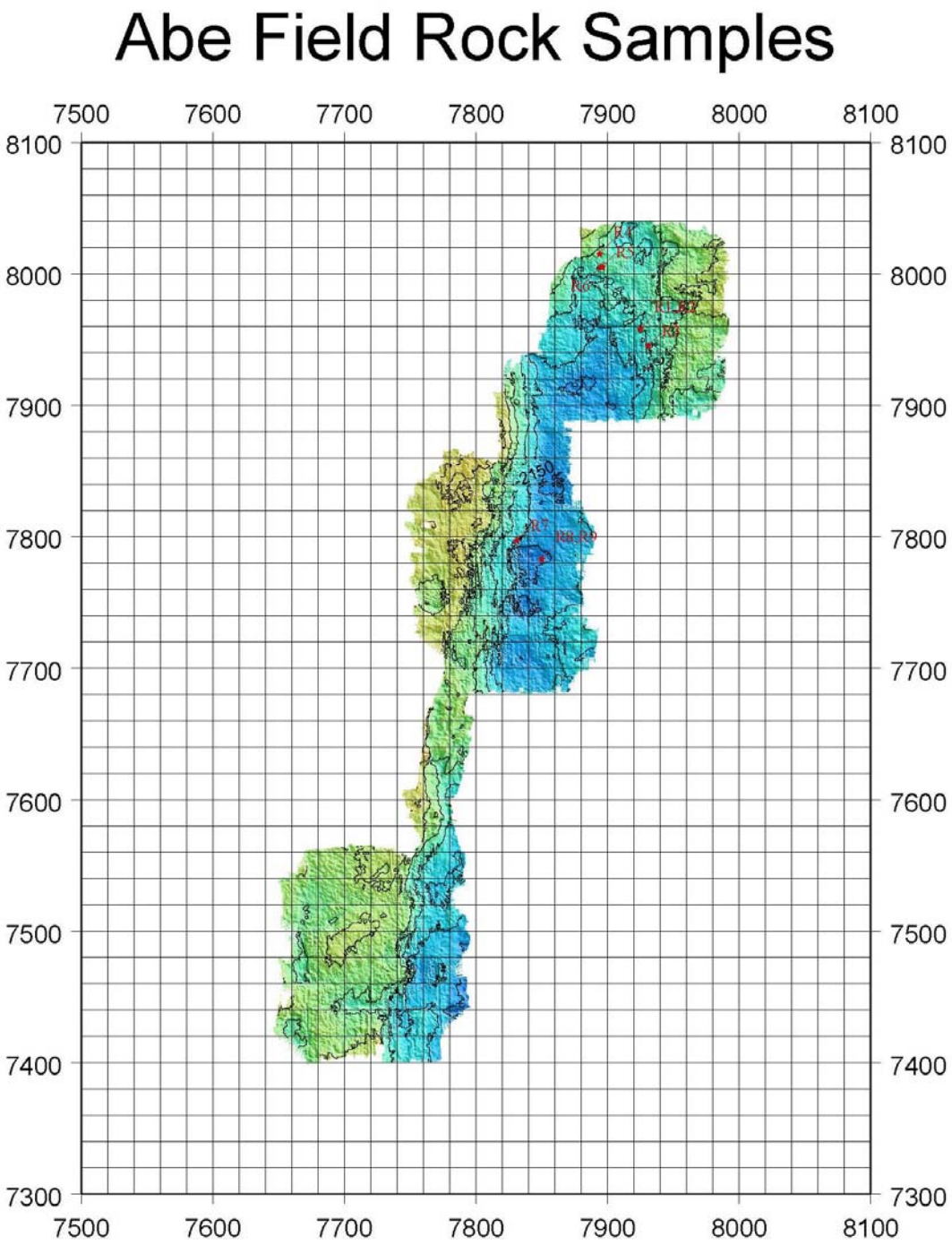
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R7
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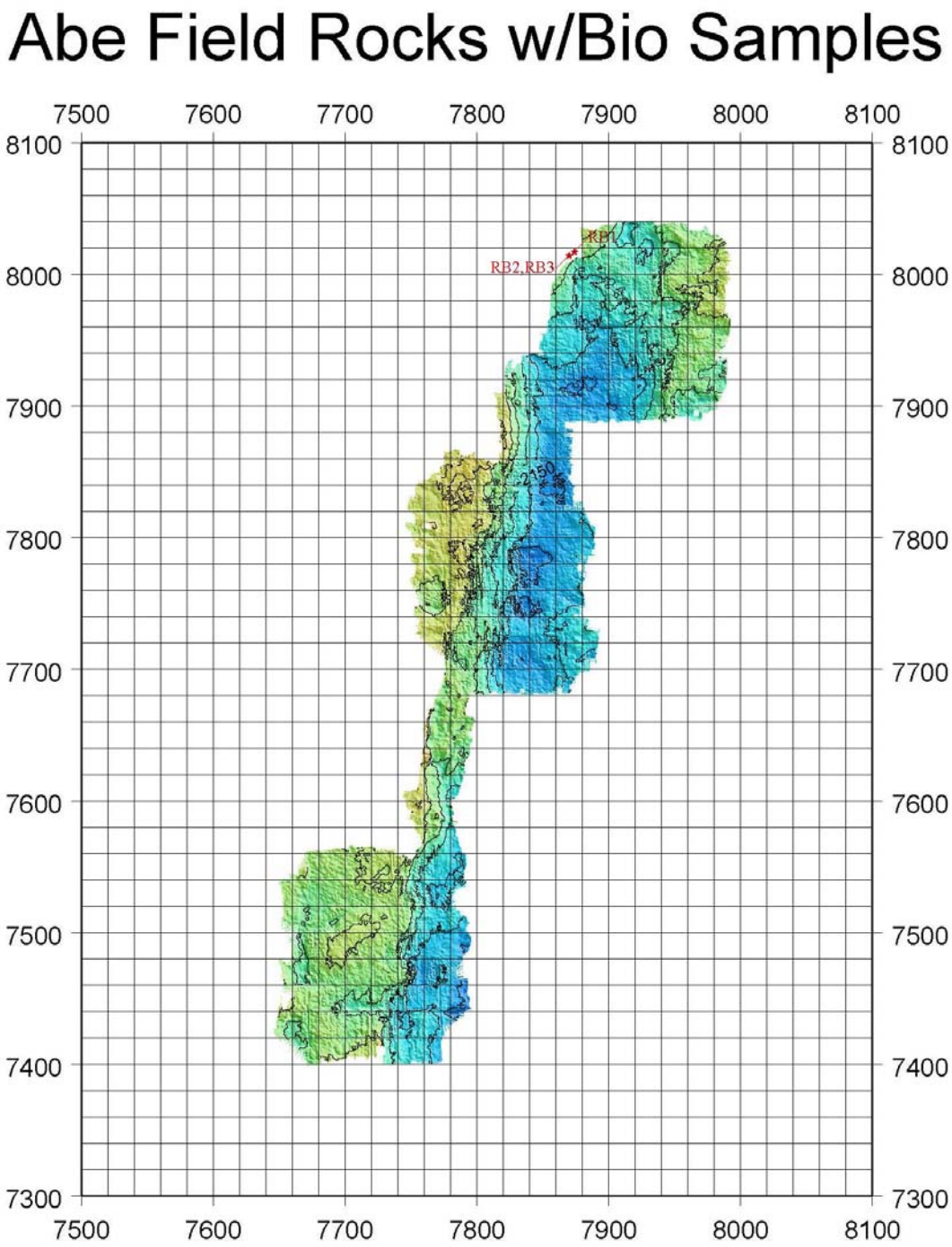
R9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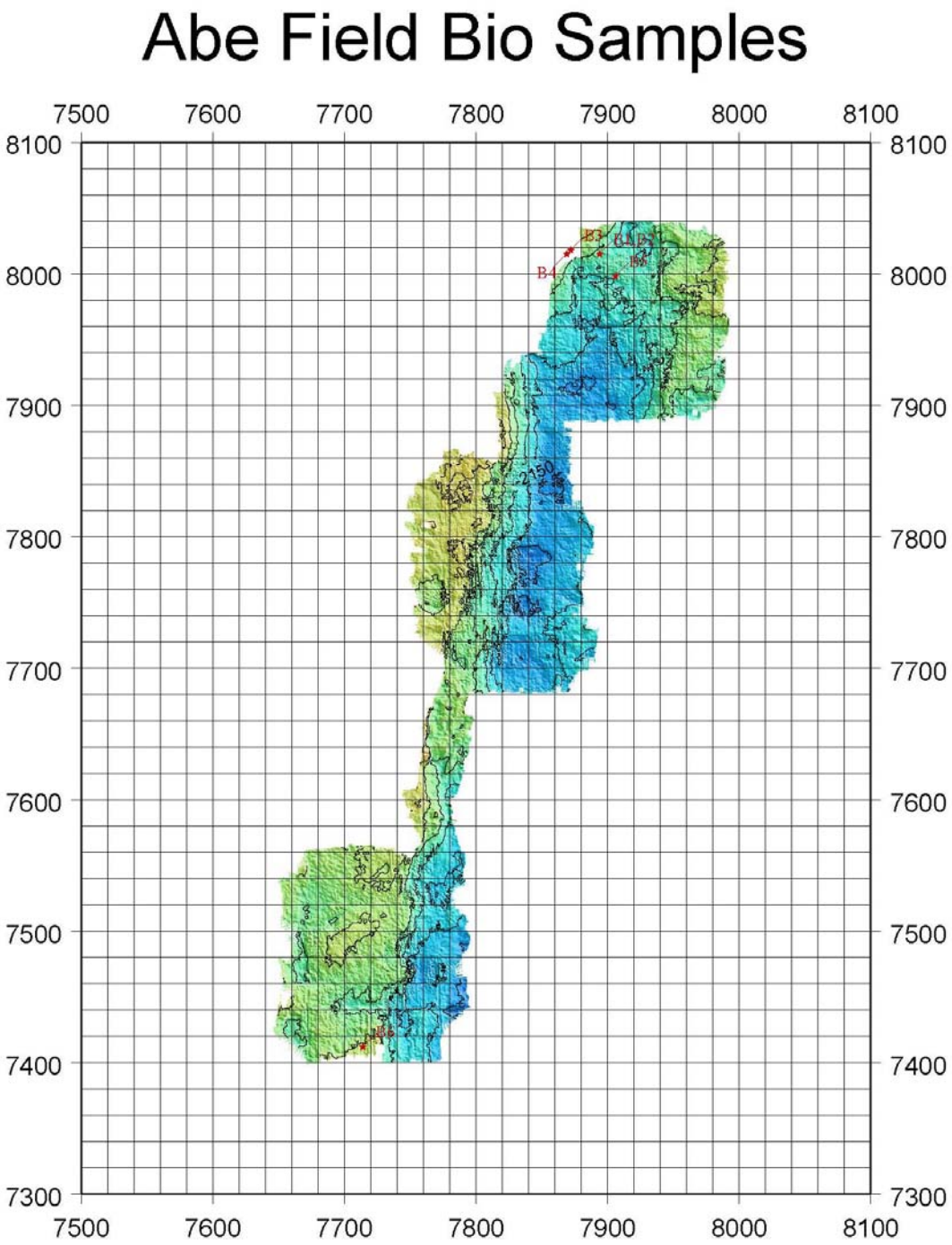
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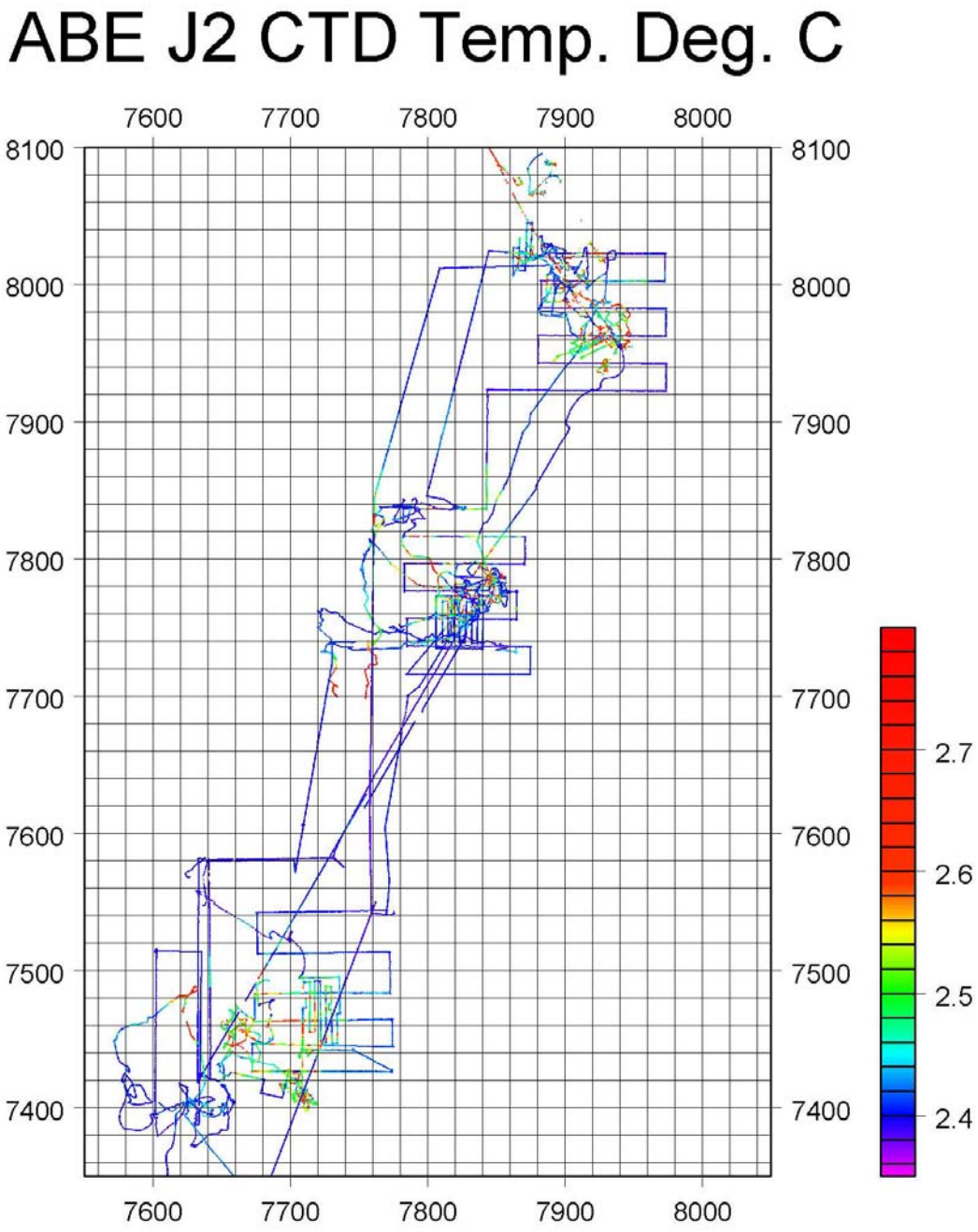
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Samples recovered from Tui Malila Vent Field on TUIM05MV, April-May 2005 (Lat/lon origin-22 -01.000 -176 -35.00)

ID#	Sample Number J2-	VV Event #	Date/ Time (UTC)	Position (X,Y)	Nav version #	Vehicle depth (m)	Vehicle hdg	Vehicle altitude (m)	Sample Type/ collection method	Contact person	Comments
R1	132-1-R1	33131	04/24 08 20	1492, 2929	April-May 05	1851.58	207.08	8.239	Active sulfide chimney/ grab	Meg Tivey	Small sulfide piece w/ fluid pair from active black smoker chimney.
TM1	132-1-W1-IGT1	33272	04/24 08 47	1493, 2929	April-May 05	1851.648	238.46	8.239	IGT1 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Fluid pair for chimney sample 132-1-R1. T ~ 277 °C
R2	132-1-R2	?	04/24 ~ 08 47	1493, 2929	April-May 05				Active sulfide chimney/ grab	Meg Tivey	Volunteer from same active sulfide structure.
M14	Mkr 14	33461	04/24 09 29	1493, 2928	April-May 05	1851	240	8	Marker 14		At base of active chimney complex (samples taken)
TM2	132-2-W1-IGT3	33743	04/24 10 11	1472, 2890	April-May 05	1843.924	283.49	8.239	IGT3 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	High T, focused black smoker. No sulfide pair. T ~ 312 °C
B1	132-3-B1	34143	04/24 13 27	1567, 3046	April-May 05	1886.294	117.96	0.925	Mussels, snails (w/ andesite) /grab	Stacy Kim	*Bathymodiolus Alviniconcha*, and *Ifremeria* scooped from andesite.
TM3	132-4-W1-IGT7	34207	04/24 13 53	1567, 3046	April-May 05	1883.587	121.97	1.85	IGT7 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	In area of diffuse flow colonized by mussels. T~ 31 °C.
M24	Mkr 24	34240	04/24 14:24	1566, 3047	April-May 05	1884.998	146.1	3.3	Marker 24		To left of rich mussel and snail community.
RB1	132-5-RB1	34227	04/24 14 12	1557, 3047	April-May 05	1883.879	112.26	1.813	Barnacles (w/ andesite) /grab	Stacy Kim	Sampled from volcanic flow at bottom of sulfide pile. Ropey andesite, little surface alteration.

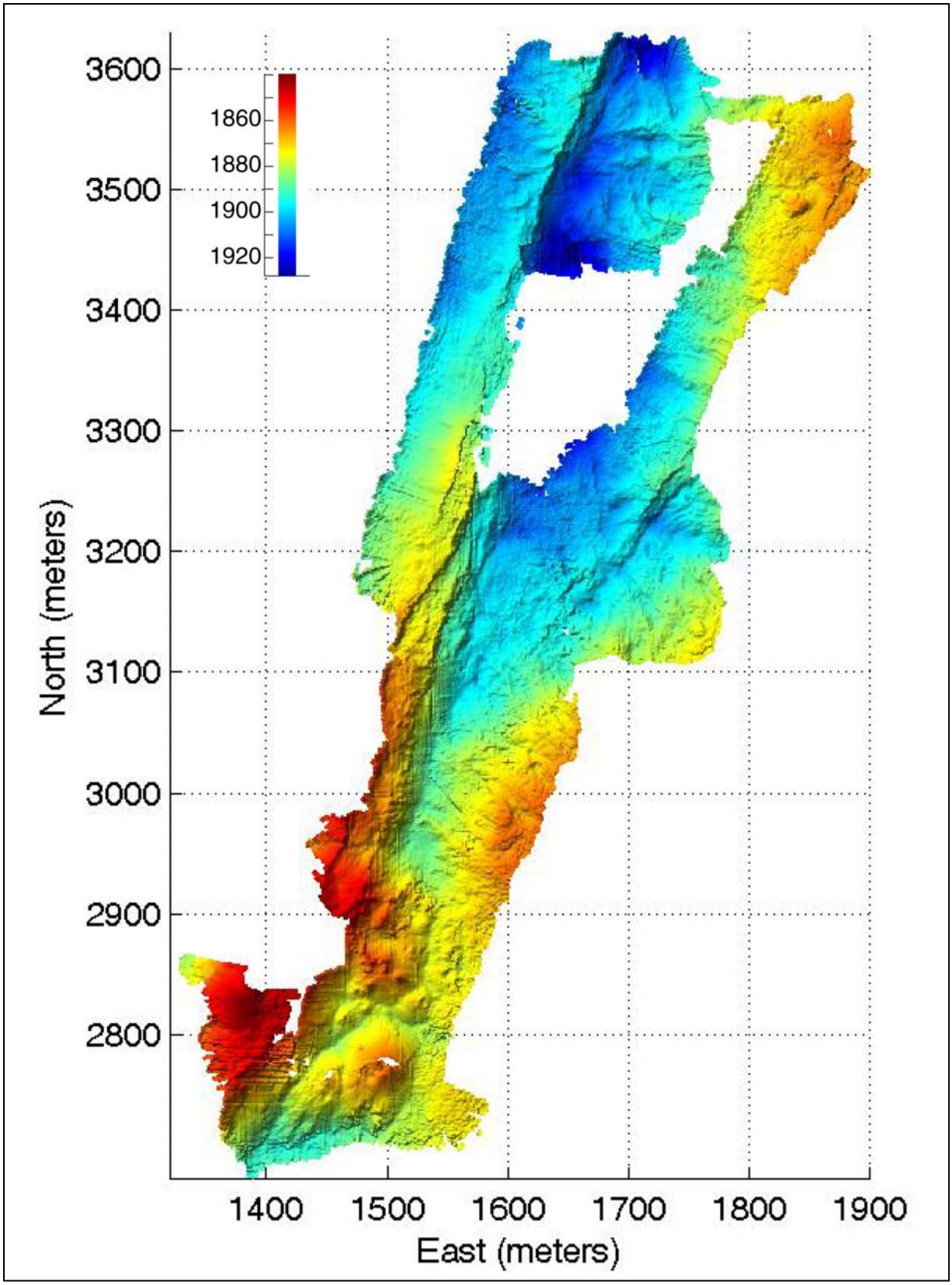
RB2	132-6-RB1	34255	04/24 14 31	1570, 3047	April-May 05	1884.991	121.37	2.938	Anemone (w/ andesite) /grab	Stacy Kim	Ropey andesite with surficial Mn(?) oxide coating.
B2	132-7-B1	34274	04/24 14 46	1568, 3041	April-May 05	1882.433	143.58	4.463	Shrimp/ slurp	Stacy Kim	Shrimp (sp?) & crab (*Galatheid*) from volcanic basement surface.
M25	Mkr 25	34372	04/24 16 39	1574, 2996	April-May 05	1875	155	2	Marker 25		On top of large "*mothership*" flange structure. High T, diffuse flow area.
R3	132-8-R1	34375	04/24 16 46	1574, 2996	April-May 05	1875.219	155.41	2.063	Active sulfide flange/ grab	Meg Tivey	Piece of active sulfide from outer edge of "*mothership*" flange.
TM4	132-8-W1-IGT5	34453	04/24 17 24	1574, 2996	April-May 05	1876.631	152.88	0.738	IGT5 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	High T, diffuse floe from active flange for sulfide pair. T(max) 175 °C.
R4	132-9-R1	34517 – 34533	04/24 18 12	1515, 2992	April-May 05	1867.469	281.19	3.188	Active sulfide chimney/ grab	Meg Tivey	Fe-Zn(?)-rich interior w/ outer globular Fe-oxide coating. Sampled for microbiology.
R5	132-9-R2	34537	04/24 18 17	1515, 2992	April-May 05	1867.374	285.78	3.038	Relict sulfide chimney/ grab	Meg Tivey	Fe-Zn(?)-rich sulfide w/ outer Fe-oxide and microbial coatings
R6	132-10-R1	34810 – 34834	04/24 21 47	1532, 2946	April-May 05	1880.913	271.84	1.6	Hydrothermal talus/ breccia/ grab	Meg Tivey	Extensively altered talus and hydrothermal breccia.
R7	132-11-R1	34875 - 34884	04/24 22 04	1537, 2931	April-May 05	1874.941	211.59	5.763	Andesite/ grab	Meg Tivey	Highly fractured and ropey andesite tableaus. Exterior of piece has Fe/Mn oxides. Some sedimentation.

R8	132-12-R1	34908 – 34924	04/24 22 12	1531, 2927	April-May 05	1867.014	212.75	5.688	Relict sulfide mound/ grab	Meg Tivey	Large relict sulfide mound w/ extensive Fe-oxide crust
R9	132-13-R1	35033	04/24 22 30	1529, 2912	April-May 05	1863.627	169.58	4.363	Active sulfide chimney/ grab	Meg Tivey	Small active spire from larger sulfide structure. T(int) 246 °C; T(ext) 2.2 °C
TM5	132-14-W1-IGT6	35612	04/25 00 15	1486, 2841	April-May 05	1863.213	206.42	3.413	IGT6 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Temp for large gray/white smoker chimney. T during sampling ~ 213 – 227 °C. Tmax = 264 °C.
R10	132-14-R1	35629	04/25 00 21	1486, 2841	April-May 05	1863.254	206.15	3.363	Active sulfide chimney/ grab	Meg Tivey	Thin walled cpy-lined active chimney sulfide. Pair for fluid sample TM5.
R11	132-15-R1	35675	04/25 00 39	1481, 2841	April-May 05	1868.636	159.77	1.675	Relict sulfide chimney/ grab	Meg Tivey	From base of large sulfide structure. Some microbial mat of surfaces
B3	132-16-B1	35770	04/25 01 01	1516, 2893	April-May 05	1861.646	255.24	3.188	Shrimp/ slurp	Stacy Kim	Shrimp, scaleworms, white microbial mat from large sulfide mound
R12	134-1-R1	39063	04/28 07 44	1566, 2769	April-May 05	1869.898	144.42	12.502	Pillow lava/grab	Meg Tivey	Andesite pillow lava w/ low amount of surface alteration/staining. Sediment.
R13	134-2-R1	39094	04/28 07 47	1565, 2768	April-May 05	1870.163	140.34	12.502	Pillow lava/grab	Meg Tivey	Piece of large andesitic lava flow.
TM6	134-3-W1-Mgreen	39714	04/28 09 52	1479, 2875	April-May 05	1844.576	283.79	12.502	Majors water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Same orifice as sampled by J2-132-2-W1-IGT3 (TM2). T ~ 285 – 295 °C.
TM6	134-3-W1-Mred	39746	04/28 10 01	1479, 2875	April-May 05	1844.671	283.58	12.502	Majors water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample as above. Same orifice. No T data repeated.

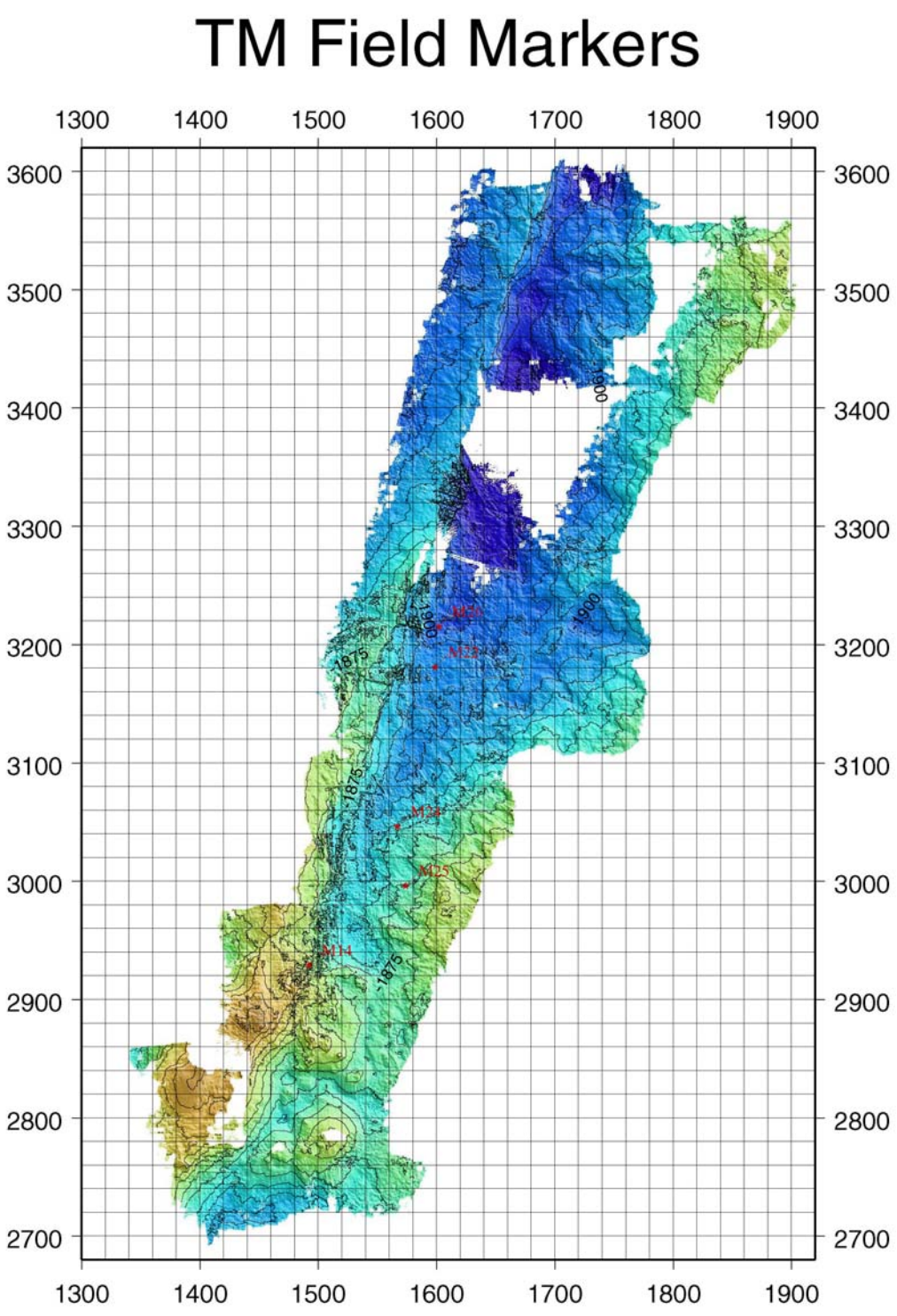
R14	134-4-R1	39809	04/28 10 16	1479, 2880	April-May 05	1844.813	309.59	12.502	Hydrothermal talus/ breccia/ grab	Meg Tivey	Highly altered sulfide talus from base of chimney complex/escarpment.
TM7	134-5-W1-IGT5	40000	04/28 11 15	1572, 2999	April-May 05	1875.362	176.27	12.502	IGT5 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	High T, diffuse flow. Replicate fluid sample for TM4. Tip of "*mothership*" flange. T (max) ~ 175 °C.
B4	134-6-B1	40550	04/28 15 02	1568, 3065	April-May 05	1886.545	102.49	2.113	Sediment/ scoop	Stacy Kim	Sediment gathered for biological studies.
TM8	134-7-W1-IGT3	42105	04/28 01 40	1599, 3181	April-May 05	1894.614	196.77	1.5	IGT3 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	From white/grey smoker. T ~ 264 – 265 °C.
TM8	134-7-W2-IGT6	42220	04/28 02 21	1614, 3177	April-May 05	1894.994	196.08	1.588	IGT6 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample. ICL6 temp probe not working.
R15	134-7-R1	42250	04/28 02 35	1599, 3181	April-May 05	1894.852	189.73	1	Active sulfide chimney/ grab	Meg Tivey	271 °C (in); 5–16 °C (out); 4.2 °C (ambient)
M22	Mkr 22	42271	04/28 02 36	1599, 3181	April-May 05	1894.18	195.19	2.125	Marker 22		Base of white/grey smoker complex; site of sampling. ***Nav. poor ±10m***.
R15	134-8-R1	42720	04/28 05 46	1599, 3181	April-May 05	1895.829	185.66	0.738	Inactive sulfide chimney/ grab	Meg Tivey	Part of same chimney complex. Friable Zn-rich beehive sulfide. No direct focused flow from this spire.
R16	134-8-R2	42729	04/28 05 50	1599, 3181	April-May 05	1895.808	185.96	0.738	Inactive sulfide chimney/ grab	Meg Tivey	Smaller friable sulfide piece from adjacent spire. Cpy-lining conduits?

R17	134-9-R1	43456	04/28 09 02	1599, 3198	April-May 05	1901.624	245.02	9.501	Active sulfide chimney/ grab	Meg Tivey	Mixed green/grey/brown sulfide w/ anhydrite. Several Cu-Fe rich conduits. Surface orange colliform textures
TM9	134-9-W1-IGT4	43543	04/28 09 12	1599, 3198	April-May 05	1901.665	245	9.501	IGT4 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Focused, Grey smoker. Fluid pair for sulfide 134-9-R1 (R17). T ~ 195 °C.
R18	134-10-R1	43902	04/28 09 42	1602, 3215	April-May 05	1901.373	326.43	9.501	Active sulfide flange/ grab	Meg Tivey	Small white flange, porous dendritic textures w/ anhydrite interspersed No T data. Dense snail population.
M26	Mkr 26	43941	04/28 09 50	1602, 3215	April-May 05	1901.346	325.17	9.501	Marker 26		Base of flange structure.
RB3	134-11-RB1	44057	04/28 10 08	1590, 3207	April-May 05	1899.798	198.44	9.501	Anemone w/ host rock/grab.	Stacy Kim	Small anemone from ropey andesite escarpment. Near small sulfide spires.
TM10	138-1-W1-IGT2	51559	05/04 22 10	1594, 3225	April-May 05	1897.797	175.34	1.988	IGT2 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Focused, white/gray smoker. T ~ 229 °C.
TM10	138-1-W2-IGT4	51587	05/04 22 19	1594, 3225	April-May 05	1897.736	169.96	1.725	IGT4 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. T ~ 229 °C.
R19	138-2-R1	51730	05/04 22 57	1595, 3226	April-May 05	1898.923	325.66	1.875	Relict sulfide/ grab	Meg Tivey	Relict spire close to sampled fluids.
R20	138-3-R1	51906	05/04 23 59	1573, 3226	April-May 05	1888.71	305.37	3.526	Basalt/ grab	Meg Tivey	Columnar basalt from exposed outcrop. Possible dike intrusion?
R21	138-4-R1	51916	05/05 00 04	1576, 3234	April-May 05	1885.996	276.87	5.638	Relict sulfide flange/ grab	Meg Tivey	Barite-rich flange, knobs on upper surfaces, coating of dark, colliform oxide(?)

R22	138-5-R1	52106	05/05 01 28	1577, 2994	April-May 05	1876.108	145.26	1.425	Relict sulfide "flange" /grab	Meg Tivey	Sulfide near "*mothership*" flange. Mixed light/dark grey sulfide w/ amorphous Si coating?
TM11	138-6-W1-IGT6	52210	05/05 02 03	1573, 3040	April-May 05	1885.48	190.69	2.125	IGT6 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse flow from flow in fissures of andesite. T ~ 16 – 24 °C. *Alviniconcha* snails present.
R23	138-7-R1	52446	05/05 03 20	1529, 2983	April-May 05	1867.279	316.17	9.864	Active sulfide chimney/ grab	Meg Tivey	Layered mixed Fe-Zn sulfide; sph crystals(?) in conduits. From edge of larger sulfide chimney.
TM12	138-7-W1-IGT7	52454	05/05 03 47	1529, 2983	April-May 05	1867.421	318.04	9.714	IGT7 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Focused, white smoker fluid. Pair to sulfide 138-7-R1. T ~ 272 °C.
TM13	138-7-W2-IGT8	52540	05/05 03 55	1529, 2983	April-May 05	1867.163	302.99	3.376	IGT8 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample. Same orifice. T ~ 263 °C.
R24	138-8-R1	52626	05/05 04 15	1534, 2931	April-May 05	1879.237	218.53	1.6	Hydrothermal talus/ breccia/ grab	Meg Tivey	Highly altered and cemented talus or possible sulfide stockwork.
R25	138-9-B1	52746	05/05 04 58	1521, 2924	April-May 05	1873.645	230.75	1.85	Sediment/ scoop	Stacy Kim	Several cm thick sediment. Microbial activity giving rise to bright yellow/brown color?
	138-10-R1	52902	05/05 05 50	1576, 2906	April-May 05	1872.437	310.43	1.713	Relict sulfide chimney/ grab	Meg Tivey	Mixed sulfide upto ~ 4 cm thick w/ extensive halo of oxides/silicates from large, inactive sulfide dome.



Tui Malila Vent Field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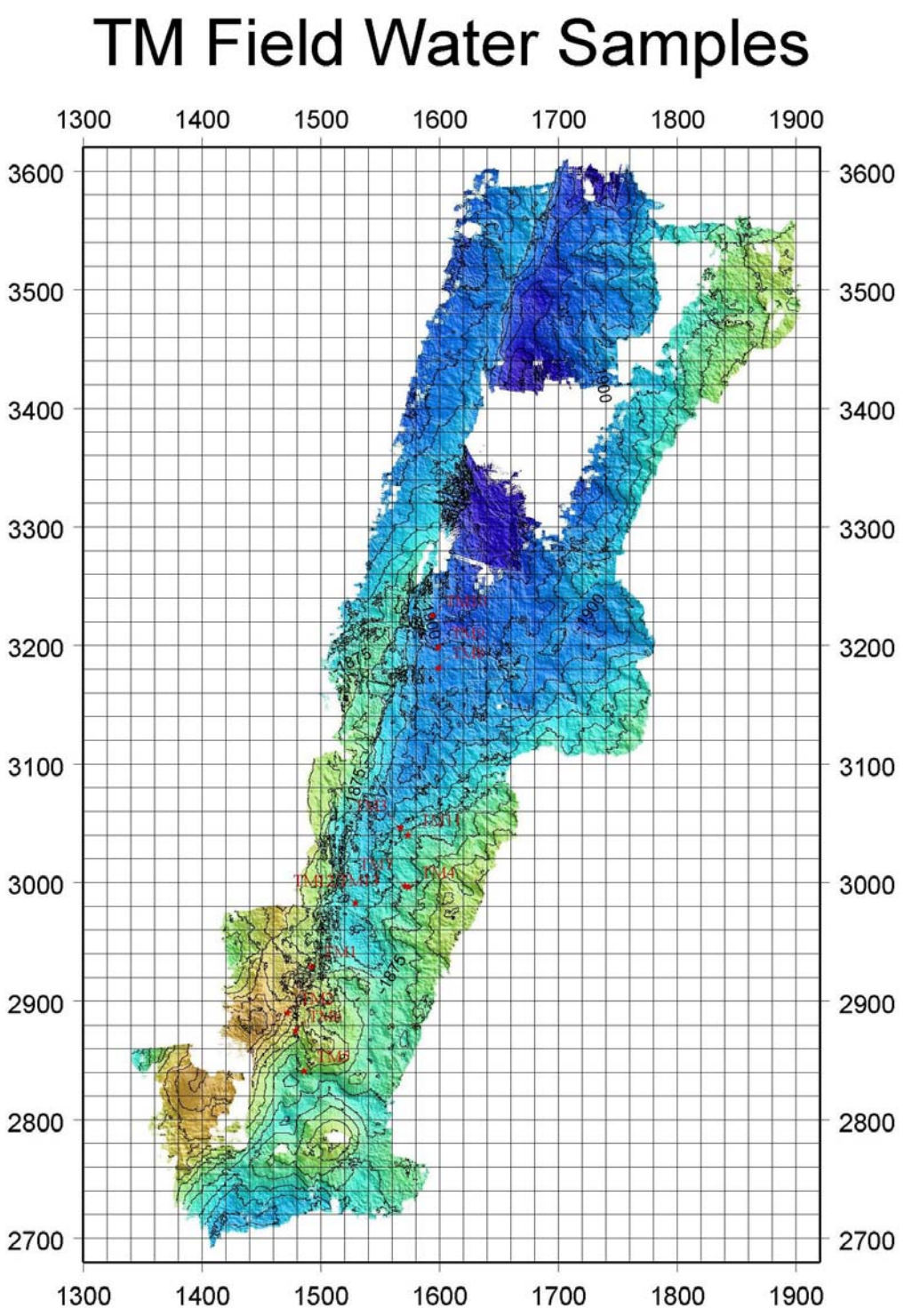
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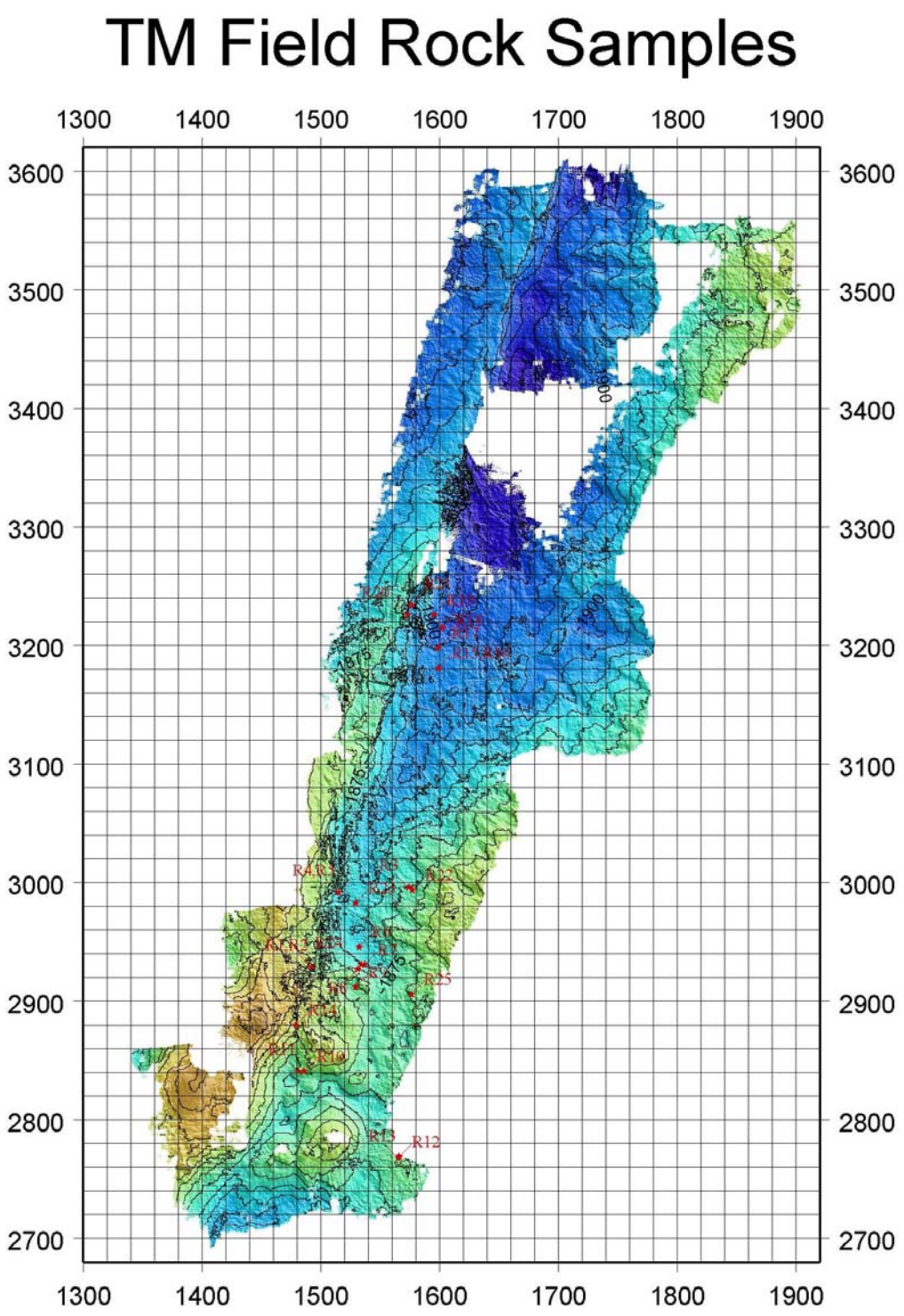
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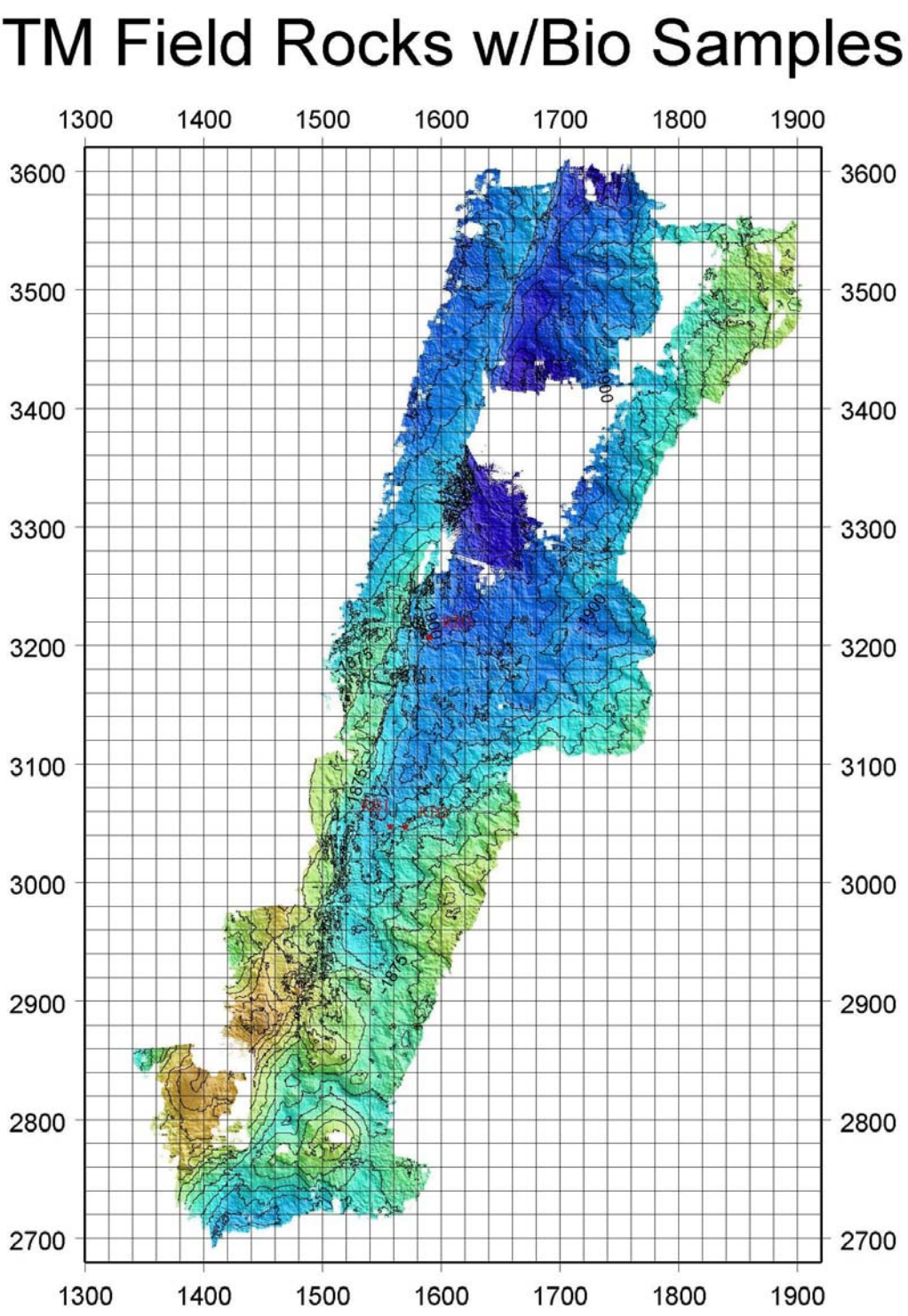
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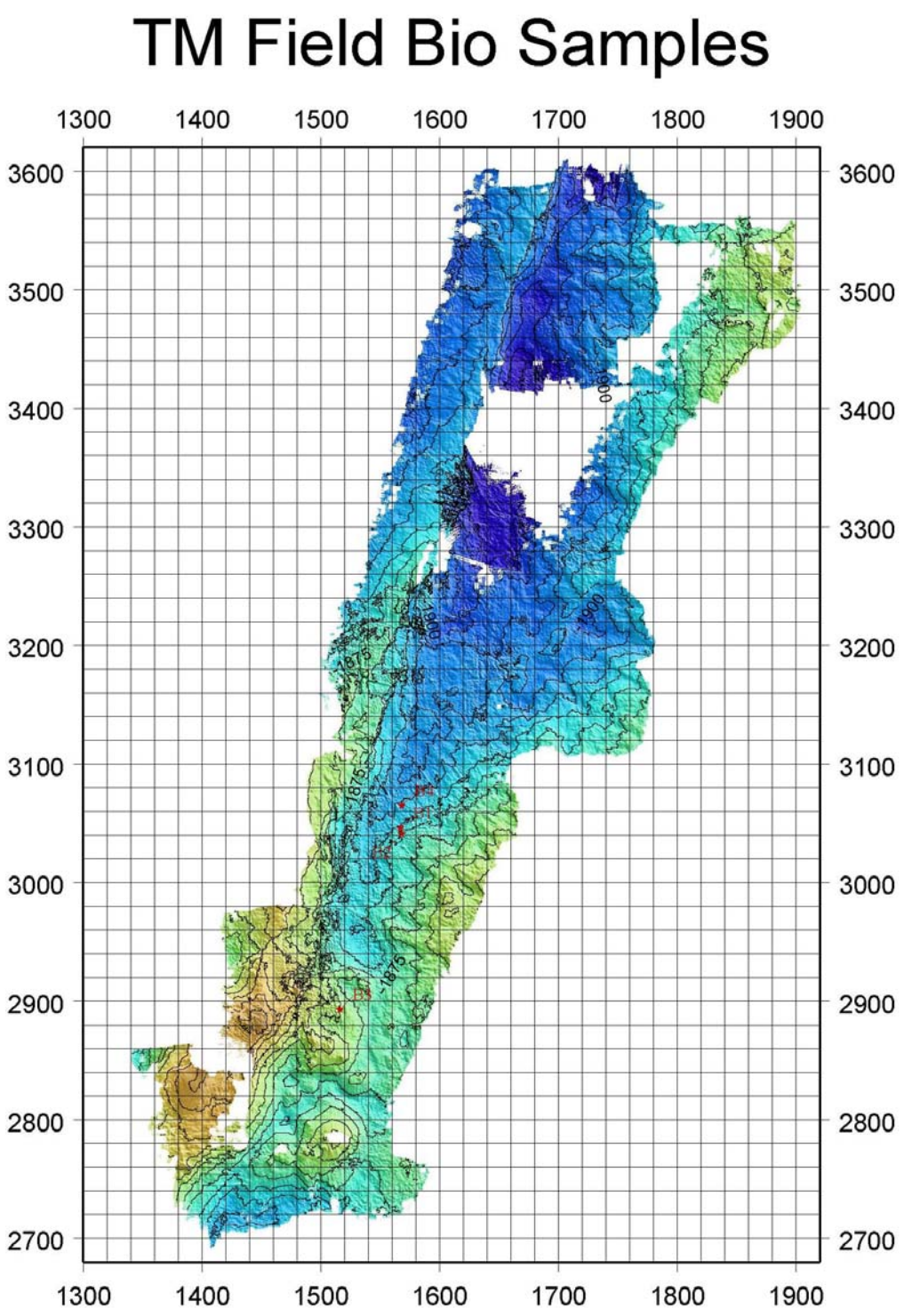
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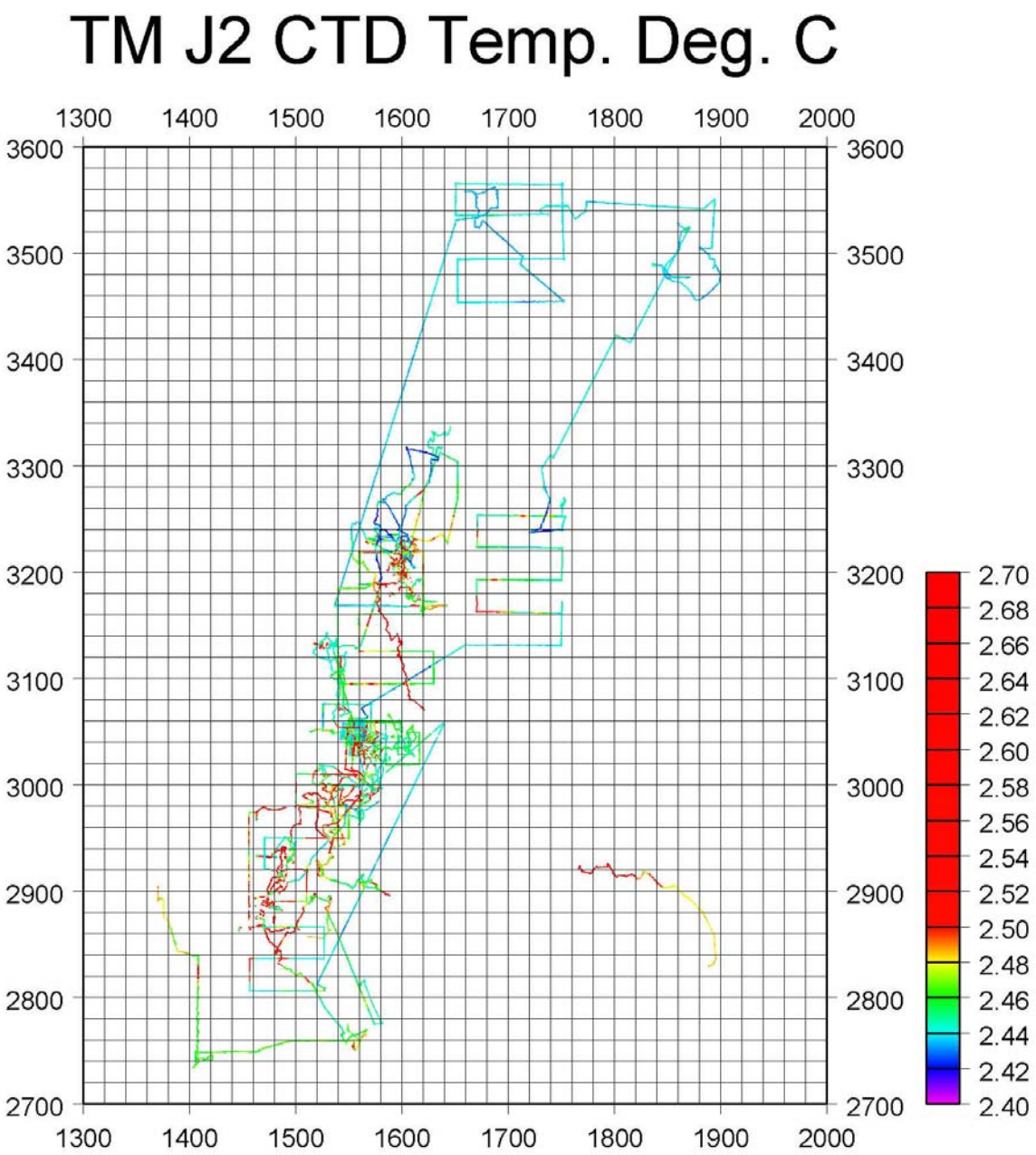
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2.40

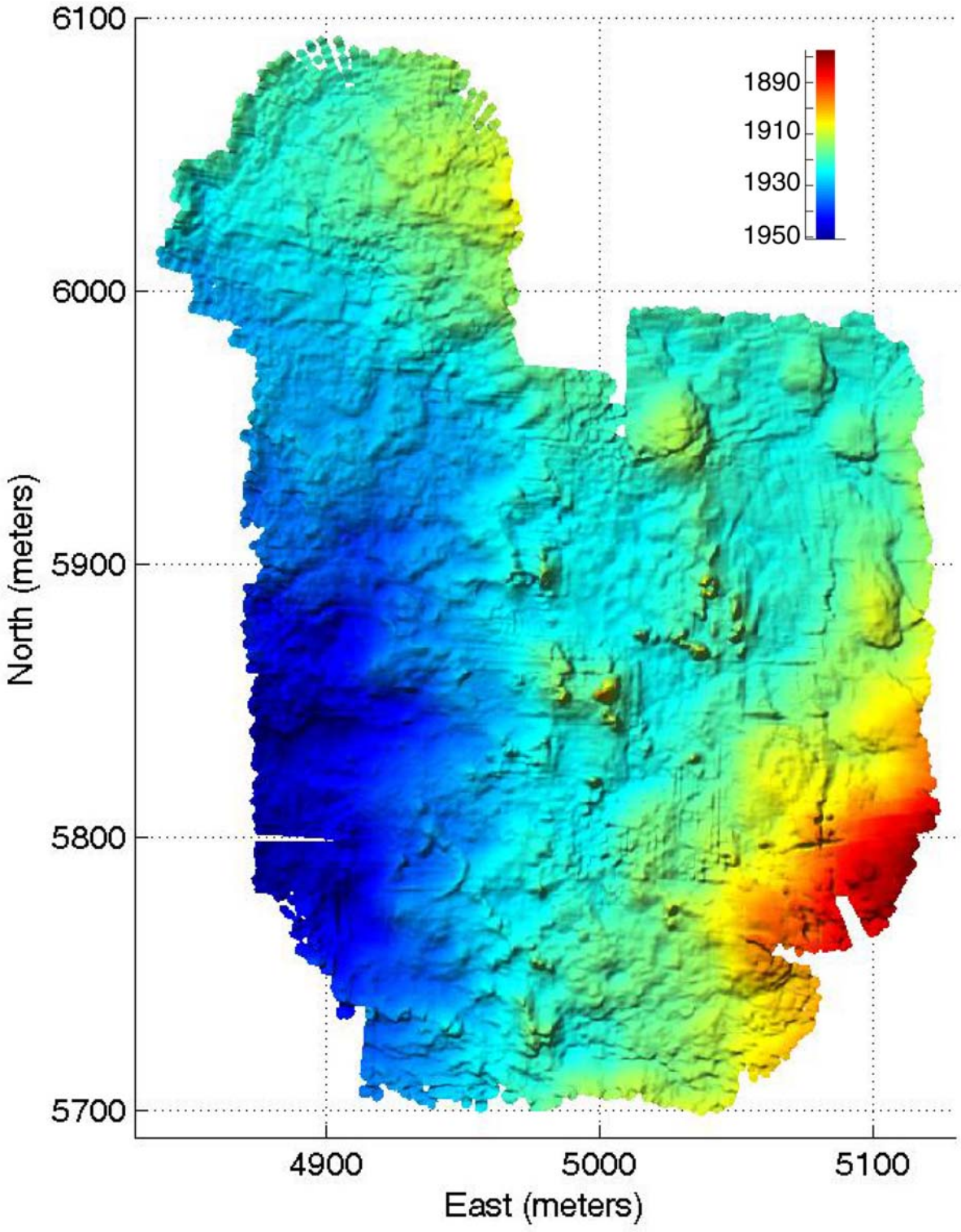
Samples recovered from Mariner vent field on TUIM05MV, April-May 2005 (Lat/lon origin -22 -14.000 -176-39.00)

ID#	Sample Number J2-	VV Event #	Date/ Time (UTC)	Position (X,Y)	Nav version #	Vehicle depth (m)	Vehicle hdg	Vehicle altitude (m)	Sample Type/ collection method	Contact person	Comments
MA 1	130-1-W1-IGT1	26535	04/15 23 22	5027, 5831	April-May 05	1907.575	54.93	13.139	IGT1 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	From orifice of large (> 10m) vigorous black smoker chimney. T = 332 °C
MA 1	130-1-W2-IGT2	26567	04/15 23 29	5027, 5831	April-May 05	1907.588	55.28	13.139	IGT2 Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample. Same orifice. T ~ 329 °C
MA 1	130-1-W3-Mred	26608	04/15 23 43	5027, 5831	April-May 05	1907.683	55.69	13.139	Majors Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Same orifice as gas-tight water samples IGT1&2. No T data.
MA 1	130-1-W4-Mgreen	26638	04/15 23 50	5027, 5831	April-May 05	1907.731	55.59	13.139	Majors Water Sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample. Same orifice as IGT1&2.
R1	130-1-R1	26670	04/16 00 09	5027, 5831	April-May 05	1908.09	59.95	13.139	Active sulfide chimney/grab	Meg Tivey	Mixed sulfide w/ cpy-lined conduit and interspersed anhydrite. Fluid-rock pair.
R2	130-1-R2	26680	04/16 00 12	5027, 5831	April-May 05	1908.07	60	13.139	Active sulfide chimney/grab	Meg Tivey	Large sulfide (~ 10 kg) piece from adjacent chimney. Given to Tongans
MA 2	131-1-W1-IGT7	28521	04/22 06 12	4966, 5764	April-May 05	1919.368	243.18	2.475	IGT7 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	High T, black smoker chimney fluid. T ~ 298 °C (top of spire).
MA 2	131-1-W2-IGT8	28548	04/22 06 22	4966, 5764	April-May 05	1919.361	243.84	2.475	IGT8 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. Temp 289 – 297 °C
R3	131-1-R1	28611	04/22 06 52	4966, 5764	April-May 05	1919.32	245.45	2.475	Active sulfide chimney/grab	Meg Tivey	Small chimlet of large BS chimney complex. Mixed Cu-Fe(?) sulfide. NEXT TO orifice sampled for fluids.
MA 3	131-2-W1-IGT3	29561	04/22 13 18	5003, 5856	April-May 05	1909.855	307.67	5.626	IGT3 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Vigorous BS fluid from large chimney complex. T~ 363 °C
MA 3	131-2-W2-IGT4	29596	04/22 13 33	5003, 5856	April-May 05	1909.848	307.89	5.876	IGT4 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample, same orifice. T ~ 364 °C (corrected)

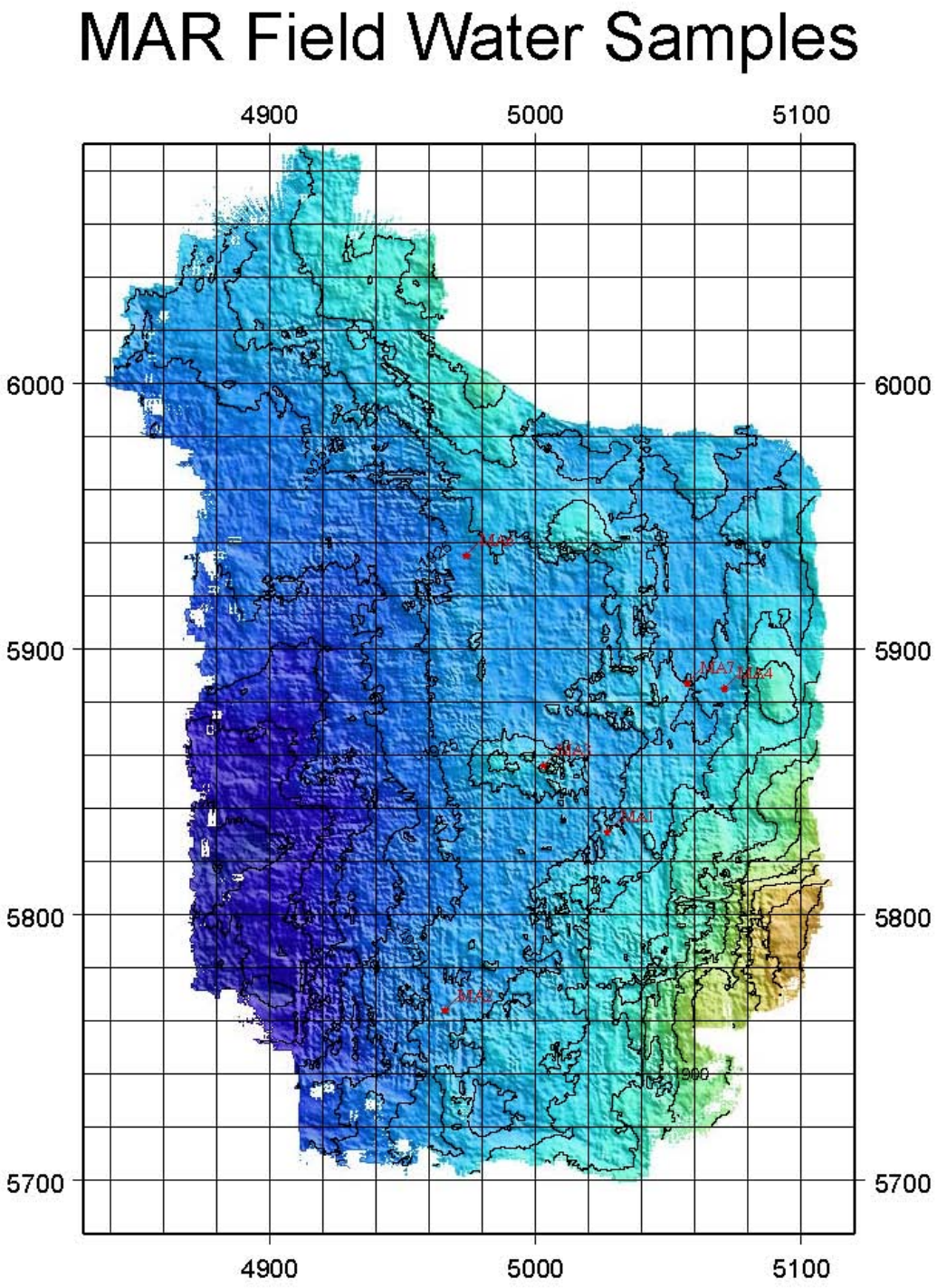
B1	131-2-B1	29730	04/22 14 20	5002, 5855	April-May 05	1909.576	337.12	5.538	Shrimp/slurp	Stacy Kim	From side of sulfide chimney near black smoker chimlet.
RB1	131-3-RB1	29994	04/22 15 44	5004, 5848	April-May 05	1907.677	347.47	10.476	Lollipops/ Dandelions/ grab	Stacy Kim	Silica "lollipops" on surface of Fe-oxide coated relict sulfide.
MA 4	131-4-W1-IGT5	30277	04/22 17 43	5071, 5885 (5048, 5896?)	April-May 05	1918.011	261.43	1.875	IGT5 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse flow from tabular sulfide structure w/ extensive white microbial mat. T ~ 26 °C
MA 4	131-4-W2-IGT6	30306	04/22 17 53	5071, 5885	April-May 05	1918.011	262.51	1.938	IGT6 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample, same diffuse flow T~ 39 to 54 °C.
B2	131-4-B1	30330	04/22 18 01	5071, 5885	April-May 05	1917.997	264.05	2.063	Microbial Mat/slurp	A-L. Reysenbach	Thick (mm's) biological mat from diffuse flow sample.
R4	131-4-R1	30376	04/22 18 22	5071, 5885	April-May 05	1918.214	262.31	2.113	Active sulfide flange/grab	Meg Tivey	Largely homogenous(?) medium-grained (Zn?) sulfide, from flange next to fluid samples MA4.
R5	131-5-R1	30509	04/22 19 02	5036, 5925	April-May 05	1915.012	207.82	1.313	Andesite/grab	Meg Tivey	Ropey andesite w/ Fe/Mn staining. No clear vesicular or glassy texture.
R6	131-6-R1(RB1)	30677	04/22 19 36	5057, 5927	April-May 05	1919.402	286.09	2.45	Andesite/grab	Meg Tivey	Jagged, ropey andesite w/ minor Fe-oxide staining. With "lollipops" attached.
R7	131-7-R1	31133 31188	04/22 22 35	4980, 5864	April-May 05	1910.75	198.73	4.563	Active sulfide chimney/grab	Meg Tivey	Friable, beehive structure, Cu-rich toward center? No T data.
R8	131-8-R1	31325	22 54	4983, 5859	April-May 05	1903.904	176.87	11.477	Relict sulfide chimney/grab	Meg Tivey	Several Pieces. Hard outer casing w/ botryoidal textures. Cu/Fe rich interior.
MA 5	135-1-W1-IGT7	44746	04/28 22 58	4981, 5838	April-May 05	1918.445	229.05	3.563	IGT7 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	White smoker fluid from top surface of flange structure. White mat coating. Tmax 261 °C.
MA 5	135-1-W2-IGT8	44778	04/28 23 08	4981, 5838	April-May 05	1918.574	234.24	3.638	IGT8 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample, same flow T ~ 244 °C.

MA 6	135-2-W1-IGT1	44890	04/28 23 51	4974, 5834	April-May 05	1917.902	349.75	3.751	IGT1 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Black smoker chimney fluid. Not v. vigorous. T ~ 240 °C.
B3	135-3-B1	44950	04/29 00 13	5021, 5794	April-May 05	1922.814	283.58	198.214	Sediment/ scoop	Stacy Kim	Patchy sediment cover w/ Fe-oxide surfaces. Sulfide fragments included.
B4	135-4-B1	45052	04/29 00 49	4909, 5753	April-May 05	1935.115	24.76	2.513	Microbial Mat/slurp	A-L. Reysenbach	Low T, diffuse flow from sulfide mound. Thick (mm's) orange microbial mat from sulfide. T > 23 °C
MA 7	135-5-W1-IGT2	45205	04/29 01 48	5057, 5887	April-May 05	1917.793	121.69	1.275	IGT2 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse flow from tabular sulfide. Same fluid as MA4. T ~ 41 °C.
RB2	135-5-RB1	45224	04/29 01 54	5057, 5887	April-May 05	1917.766	122.02	1.4	Active sulfide flange/grab	Meg Tivey	Flange, sulfide pair for fluids MA4 and MA7. Adjacent to 131-4-R1.

Japanese Markers;
93 (X5004, Y5854) High temperature site.
94 (X5011, Y5864) High temperature site.
95 (X4975, Y5834, Depth 1917 m, Hdg 336) High temperature site.



Mariner Vent Field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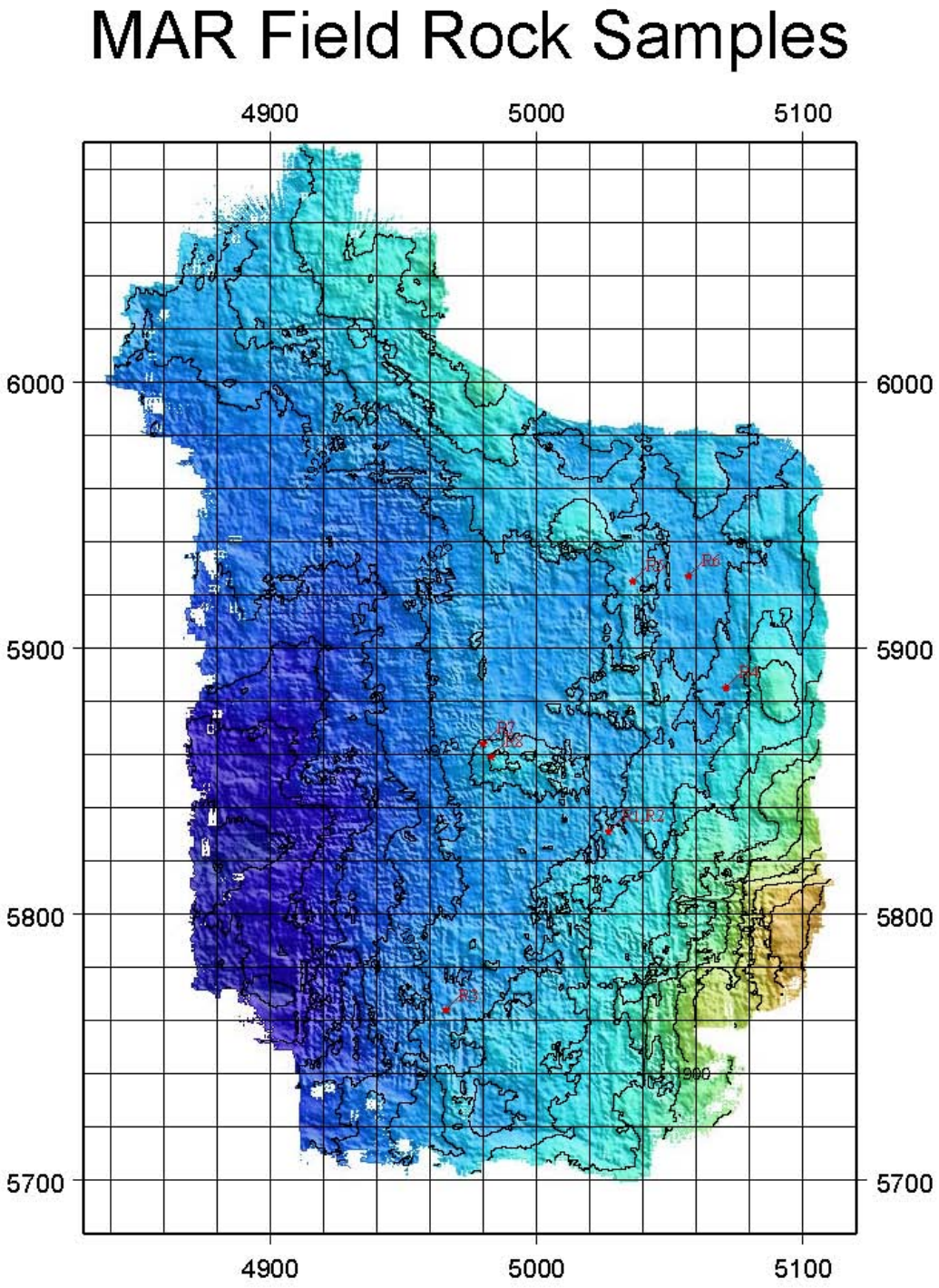
5100
6000
5900
5800
5700
MA6
MA7
MA4
MA3
MA1
MA2
900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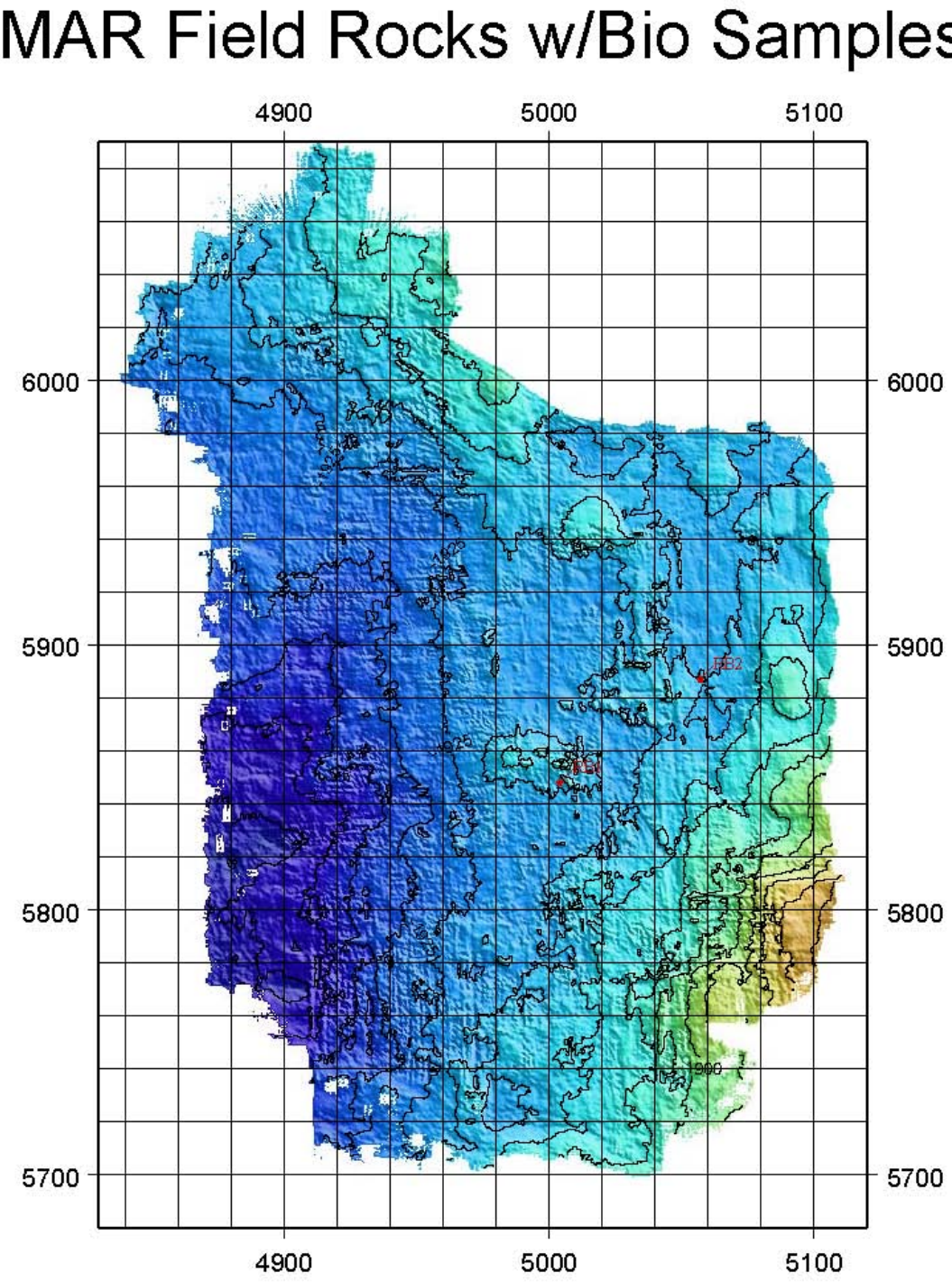
5900
5800
5700
R1
R2
R3
R4
R5
R6


MAR Field Rocks w/Bio Samples
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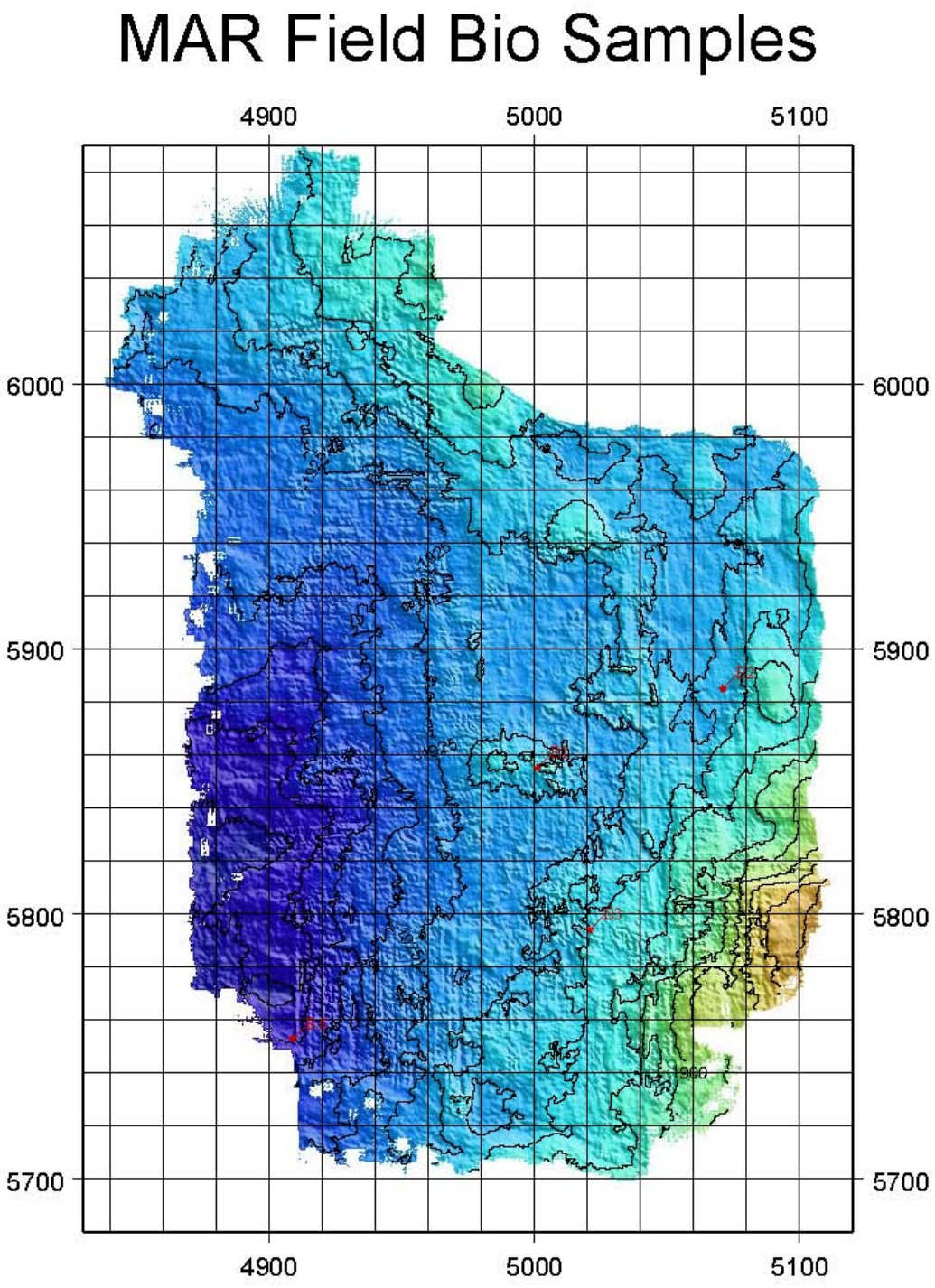
5900
5800
5700
BB2
BB1
900


MAR Field Bio Samples
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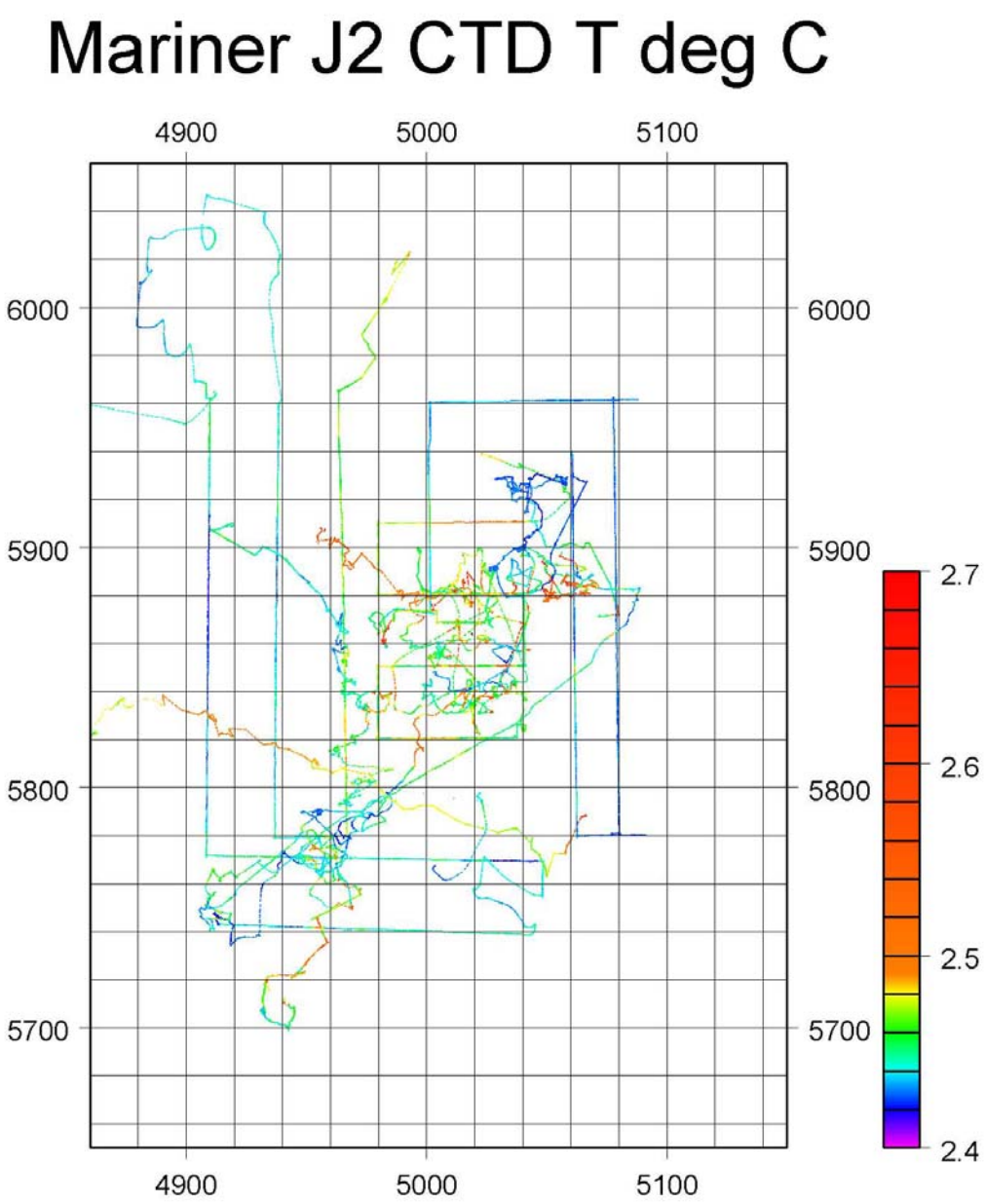
5000
5100
6000
5900
5800
5700

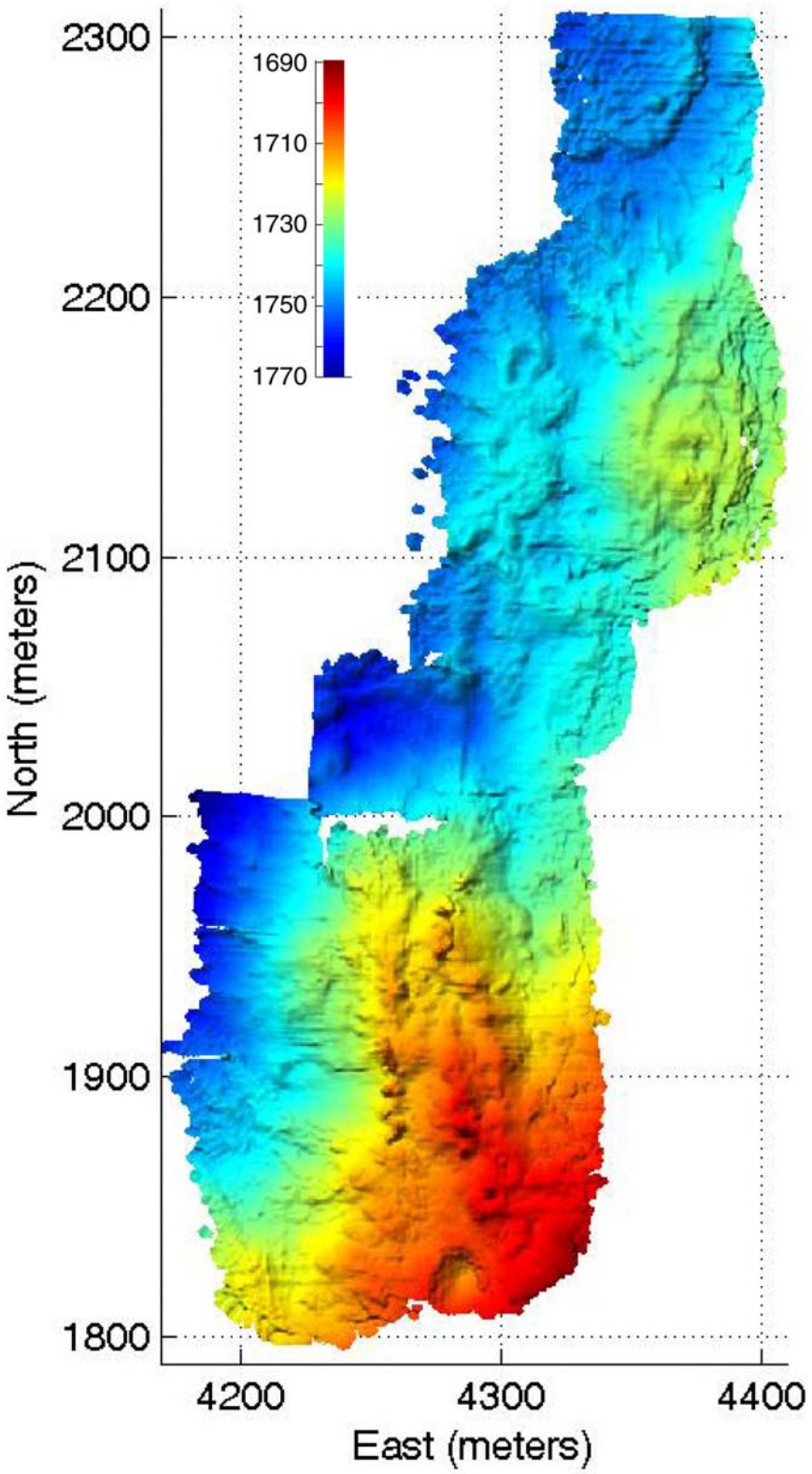

Mariner J2 CTD T deg C
4900
5000
5100
6000
5900
5800
5700
2.7
2.6
2.5
2.4

Samples recovered from Vai Lili vent field on TUIM05MV, April-May 2005 (Lat/lon origin -22 -14.000 -176-39.00)

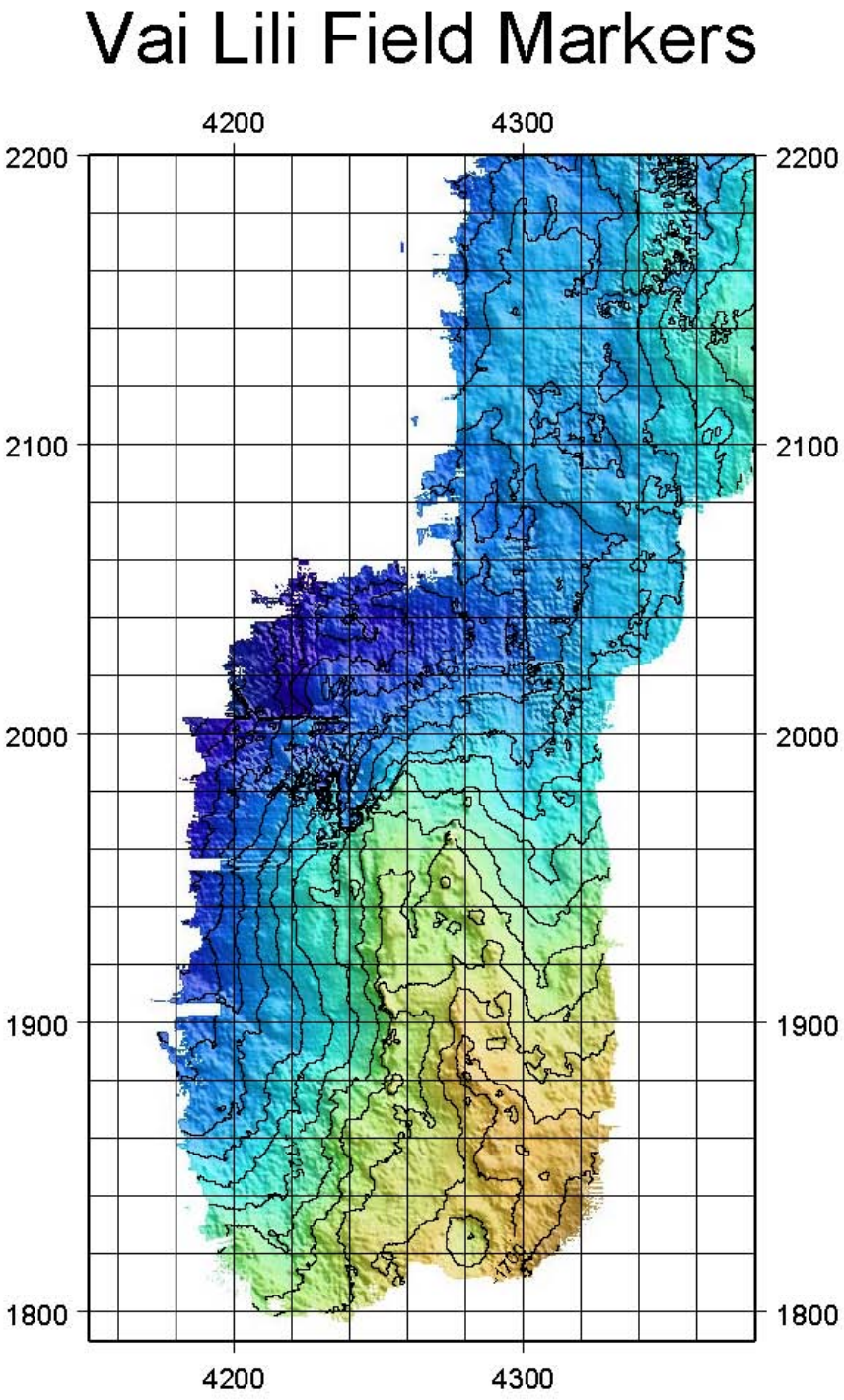
ID#	Sample Number J2-	VV Event #	Date/ Time (UTC)	Position (X,Y)	Nav version #	Vehicle depth (m)	Vehicle hdg	Vehicle altitude (m)	SampleType/ collection method	Contact person	Comments
B1	133-1-B1	36681	04/25 15 37	4341, 2114	April-May 05	1736.056	78.36	1.85	Microbial Mat/slurp	A-L Reysenbach	Yellow/Brown mat (mm – cm) thick on sulfide structures. Still active.
VL1	133-1-W1-IGT7	36768	04/25 16 04	4341, 2114	April-May 05	1736.423	77.07	1.65	IGT7 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse flow around microbial mat. T ~ 39 °C
VL2	133-1-W2-IGT8	36802	04/25 16 16	4341, 2114	April-May 05	1736.43	78.5	2.25	IGT8 fluid sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample. Same diffuse flow. T ~ 37 °C
R1	133-2-R1	37357	04/25 19 41	4288, 1819	April-May 05	1708.341	288.29	7.388	Andesite/grab	Meg Tivey	Ropey andesite from within volcanic (?) crater.
R2	133-3-R1 133-3-R2	37497	04/25 20 12	4254, 1885	April-May 05	1712.035	81.12	7.388	Andesite/grab	Meg Tivey	Surifical staining w/ Fe and Mn-oxides
R3	133-4-R1	37573	04/25 20 32	4259, 1908	April-May 05	1705.549	154.7	1.15	Andesite/grab	Meg Tivey	Fragile, striated and stained, moderately vesicular andesite w/ silica dandelions.
VL2	133-5-W1-IGT4	37989	04/25 21 40	4275, 1951	April-May 05	1711.825	128.99	2.413	IGT4 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Diffuse, clear, high T flow from underside of sulfide flange. T ~ 120 °C.
VL2	133-5-W2-IGT3	38029	04/25 21 50	4275, 1951	April-May 05	1711.655	138.52	0.738	IGT3 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample. Temp 120 °C.
R4	133-5-R1	38067	04/25 22 00	4275, 1951	April-May 05	1711.587	139.18	0.813	Active sulfide flange/grab	Meg Tivey	Largely fine-grained Fe/Zn sulfide w/ marcasite/pyrite lining underside.
VL3	133-6-W1-IGT2	38446	04/25 22 45	4290, 1972	April-May 05	1719.024	127.23	5.951	IGT2 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	White smoker, low T focused flow from bulbous sulfide mound. T ~ 69 °C. Sampling by Jap Mkr # 00.

VL3	133-6-W2-IGT1	38463	04/25 22 51	4290, 1972	April-May 05	1718.97	127.19	5.988	IGT1 water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate sample. T = 70 °C.
B2	135-6-B1	45430	04/29 07 00	4341, 2114	April-May 05	1737	170.13	0.788	Microbial Mat/slurp (clogged)/grab	A-L Reysenbach	Replicate to sample 133-1-B1. Microbial mat from andesite
R5	135-6-RB2	45449	04/29 07 14	4341, 2114	April-May 05	1736.702	205.6	0.775	Andesite/grab	Meg Tivey	Vesicular andesite, external staining. Thick microbial mat.
VL3	135-7-W1-Mgreen	45768	04/29 08 19	4289, 1973	April-May 05	1719.004	126.86	5.788	Majors water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid pairs at Mkr #00 for fluids VL3, from low T focused flow.
VL3	135-7-W2-Mred	45819	04/29 08 27	4289, 1973	April-May 05	1719.038	127.01	5.863	Majors water sample	Geoff Wheat, Jeff Seewald, Mike Mottl	Replicate fluid sample for VL3.
R6	135-8-R1	46015	04/29 08 45	4290, 1973	April-May 05	1720.158	273.51	5.438	Active sulfide chimney/grab	Meg Tivey	Sulfide from bulbous sulfide mound, close to fluids VL3.
R7	135-9-R1	46106	04/29 09 04	4279, 1954	April-May 05	1712.063	150.41	5.701	Relict sulfide chimney/grab	Meg Tivey	From inactive sulfide mound. No distinguishable chimney or orifice.
R8	135-10-R1	46206	04/29 09 09	4282, 1945	April-May 05	1707.886	183.42	4.151	Relict sulfide/grab	Meg Tivey	Relict sulfide from exterior of small (~ 1 m) mound structure w/ distinct red (Fe-oxide) staining.

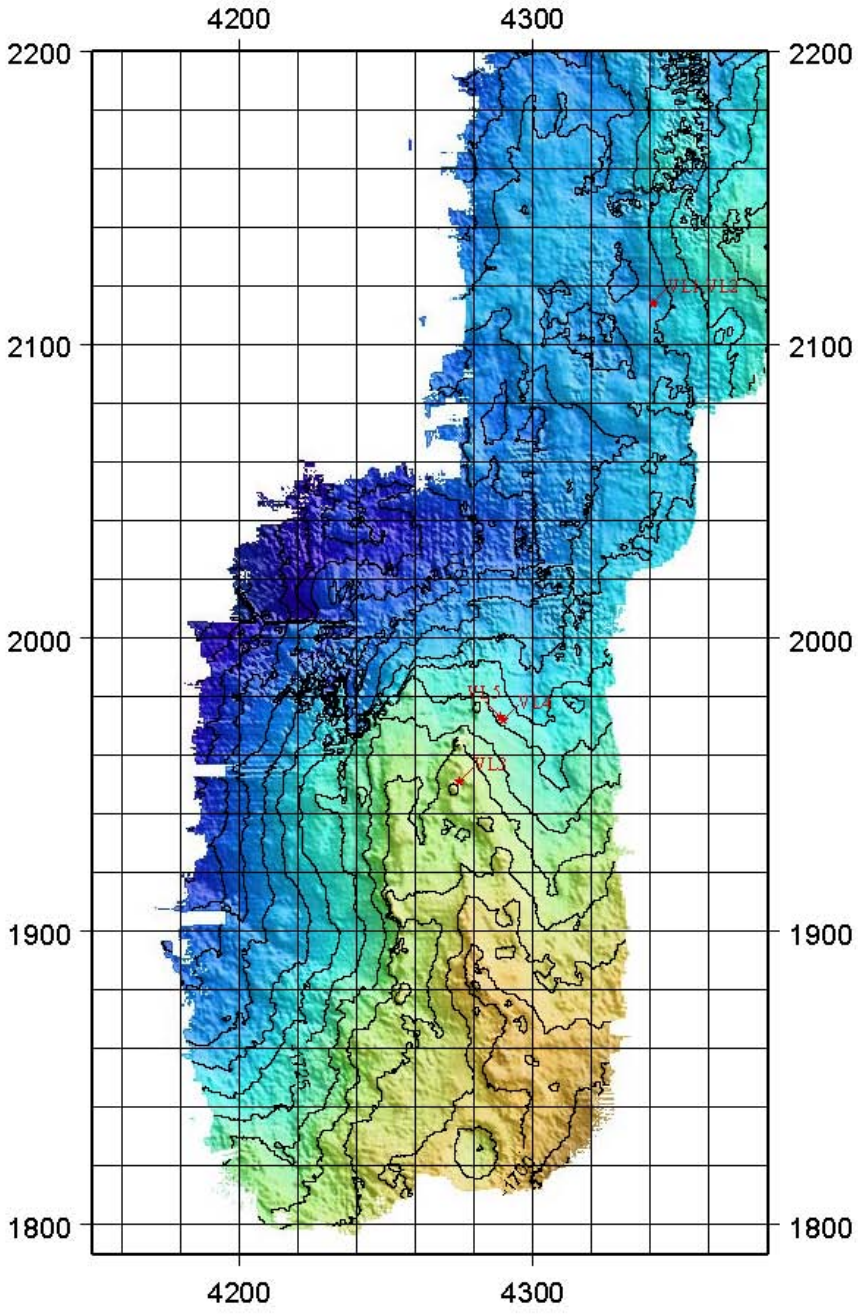
Japanese Markers;
#00 (X4289, Y1973, Z1721 m)



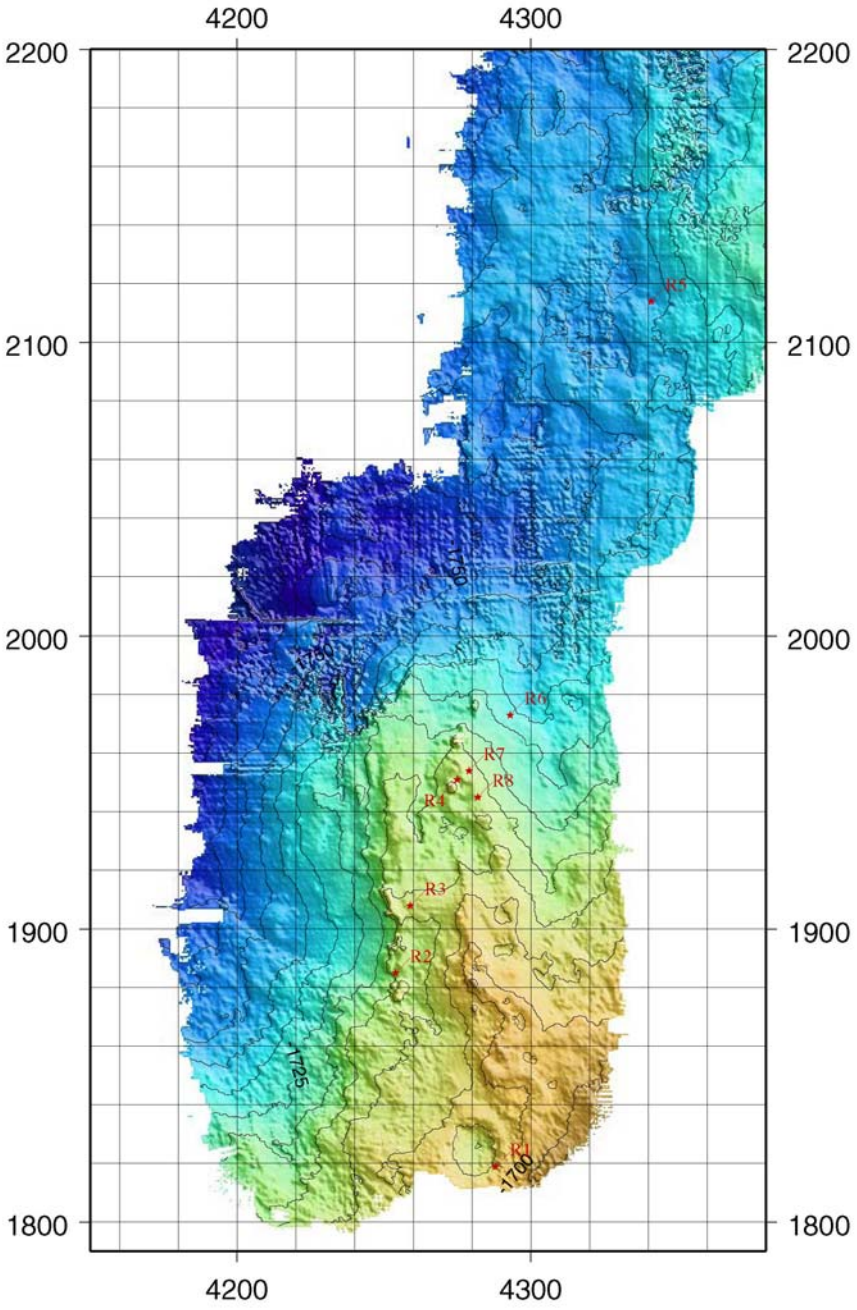
Vai Lili Vent Field


Vai Lili Field Markers
4200
4300
2200
2100
2000
1900
1800

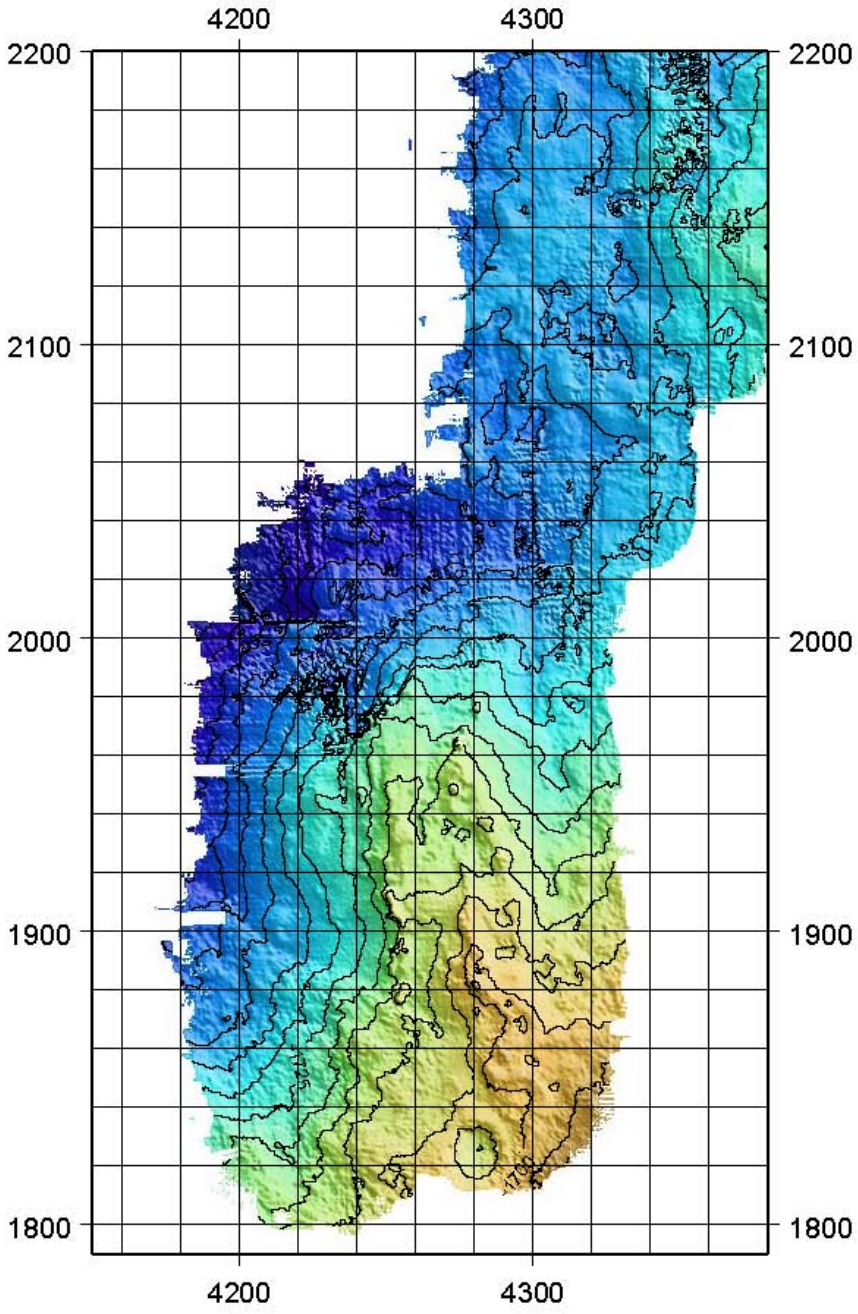
Vai Lili Field Water Samples

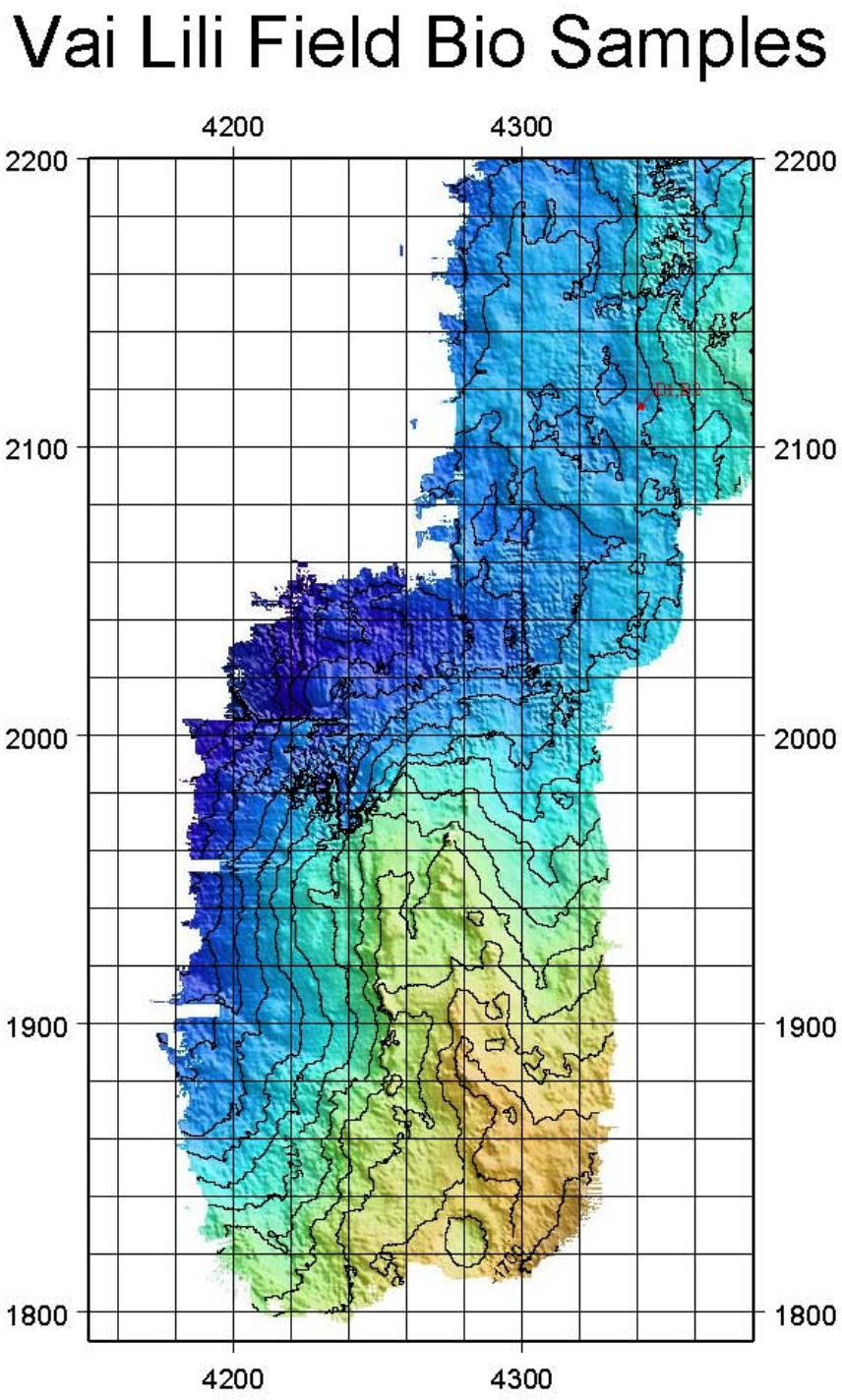


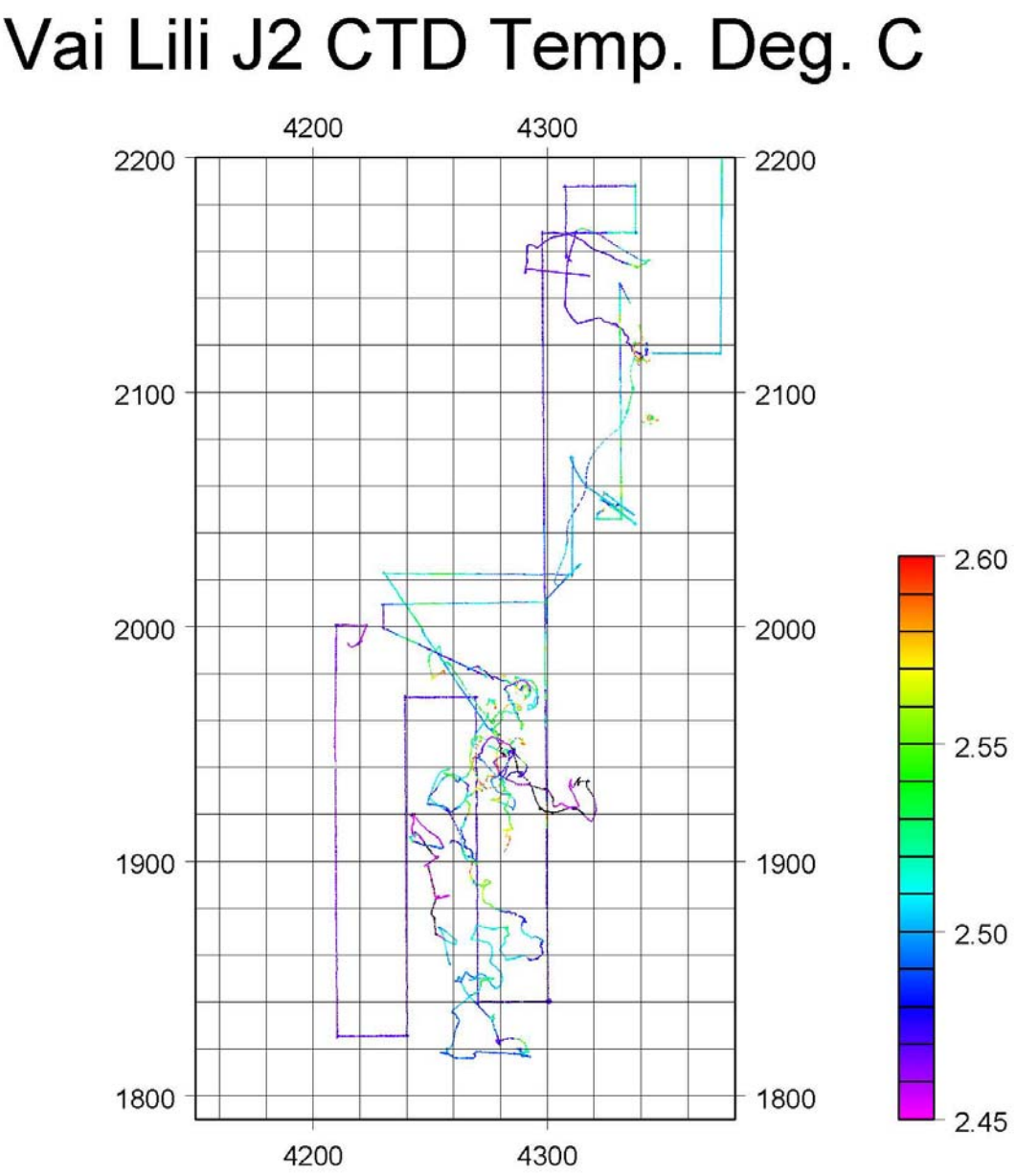
Vai Lili Field Rock Samples



Vai Lili Field Rocks w/Bio Samples




Vai Lili Field Bio Samples
4200
4300
2200
2100
2000
1900
1800


Vai Lili J2 CTD Temp. Deg. C
4200
4300
2200
2100
2000
1900
1800
2.60
2.55
2.50
2.45

Renav positions – see Ridge2000 data portal for updated information.

Renav positions for Lau sample and marker locations						
sample ID	origX	origY	newX	newY	deltaX	deltaY
124-1-W1-IGT4	6947	10638	6947.43	10642.18	0.43	4.18
124-1-W2-IGT3	6947	10638	6948.2	10641.02	1.2	3.02
124-1-W3-Mred	6947	10638	6947.78	10641.56	0.78	3.56
124-1-W4-Mgreen	6947	10638	6947.64	10640.68	0.64	2.68
Mkr 2	6947	10638	6949.99	10638.3	2.99	0.3
124-2-R1	6950	10647	6955.62	10648.23	5.62	1.23
124-2-B1	6950	10647	6952.8	10645.07	2.8	-1.93
124-3-R1	6965	10663	6969.53	10661.92	4.53	-1.08
Mkr 1	6965	10663	6971.63	10659.74	6.63	-3.26
124-3-R2	6960	10672	6968.67	10673.15	8.67	1.15
124-5-B1	6953	10640	6956.05	10637.41	3.05	-2.59
124-5-R1	6953	10639	6955.83	10638.22	2.83	-0.78
125-1-W1-IGT6	6929	10732	6935.19	10724.21	6.19	-7.79
125-1-W2-IGT7	6929	10732	6936.82	10723.04	7.82	-8.96
125-2-B1	6930	10733	6935.17	10723.18	5.17	-9.82
125-3-B1	6931	10734	6937.3	10728.43	6.3	-5.57
125-4-B1	6921	10740	6926.55	10733.47	5.55	-6.53
125-6-W1-IGT1	6927	10788	6926.86	10786.74	-0.14	-1.26
125-6-W1-IGT8	6927	10788	6926.84	10786.66	-0.16	-1.34
125-6-R1	6927	10788	6927.41	10786.86	0.41	-1.14
125-6-B1	6927	10788	6928.24	10787.27	1.24	-0.73
Mkr 6	6927	10788	6928.34	10786.82	1.34	-1.18
125-7-R1	6935	10786	6925.12	10786.71	-9.88	0.71
Mkr 4	6938	10729	6932.28	10728.19	-5.72	-0.81
125-9-B1	6921	10755	6917.1	10749.07	-3.9	-5.93
125-10-R1	6933	10736	6929.81	10733.35	-3.19	-2.65
125-11-R1	6934	10737	6934.96	10734.78	0.96	-2.22
125-12-W1-IGT2	6954	10640	6954.52	10638.38	0.52	-1.62
125-12-W2-IGT5	6954	10640	6955.35	10638.54	1.35	-1.46
Mkr 5	6954	10640	6955.89	10638.91	1.89	-1.09
137-1-R1	6917	10783	6916.91	10782.95	-0.09	-0.05
137-1-W1-IGT1	6917	10783	6916.83	10783.53	-0.17	0.53
137-1-W2-IGT2	6917	10783	6916.48	10784.62	-0.52	1.62
137-2-W1-IGT3	6928	10733	6927.82	10733.45	-0.18	0.45
137-2-W2-IGT5	6928	10733	6927.8	10733.38	-0.2	0.38
137-2-R1	6928	10733	6927.51	10733.3	-0.49	0.3
137-3-RB1	6923	10748	6934.72	10759.42	11.72	11.42
137-4-B1.B2	6930	10767	6925.65	10756.33	-4.35	-10.67
137-5-B1	6934	10725	6934.29	10725.05	0.29	0.05
137-5-W1-IGT7	6934	10725	6934.35	10725.31	0.35	0.31
137-6-R1	6960	10663	6959.51	10663.21	-0.49	0.21
137-6-R1-misc	6960	10663	6959.51	10663.21	-0.49	0.21
137-6-W1-IGT8	6960	10663	6959.46	10663.21	-0.54	0.21
137-7-R1	6954	10633	6953.68	10633.13	-0.32	0.13
137-7-B1	6953	10632	6952.72	10632.33	-0.28	0.33

126-1-W1-IGT2	6651	5560	6651.62	5561.91	0.62	1.91
126-1-W2-IGT3	6651	5560	6651.94	5562.32	0.94	2.32
126-1-R1	6651	5560	6652.13	5563.15	1.13	3.15
Mkr 8	6649	5564	6651	5567.46	2	3.46
126-2-B1	6654	5542	6647.73	5562.75	-6.27	20.75
126-2-B2	6654	5542	6648.54	5552.84	-5.46	10.84
126-2-B3	6654	5542	6650.93	5549.57	-3.07	7.57
126-3-B1	6614	5538	6618.54	5546.68	4.54	8.68
126-3-B2	6614	5538	6618.74	5546.35	4.74	8.35
126-3-W1-IGT4	6614	5538	6619.73	5545.14	5.73	7.14
126-3-W2-IGT8	6614	5538	6616.37	5546.29	2.37	8.29
Mkr 9	6629	5549	6615.83	5552.92	-13.17	3.92
Mkr 9	6617	5550	6618.76	5543.46	1.76	-6.54
126-4-R1	6629	5554	6618.95	5550.77	-10.05	-3.23
126-5-W1-IGT7	6651	5533	6652.35	5540.36	1.35	7.36
126-5-R1	6651	5533	6653.2	5538.97	2.2	5.97
Mkr 7	6651	5533	6651.47	5536.63	0.47	3.63
126-5-R2	6651	5533	6648.88	5539.46	-2.12	6.46
126-5-B1	6651	5533	6648.6	5539.62	-2.4	6.62
126-6-W1-IGT6	6627	5564	6627.28	5556.38	0.28	-7.62
126 -7-B1	6625	5565	6626.96	5556.36	1.96	-8.64
Mkr 10	6632	5562	6621.57	5557.43	-10.43	-4.57
Mkr 11	6570	5416				
Mkr 12	6539	5404	6539.14	5403.44	0.14	-0.56
127-1-W1-IGT1	6539	5404	6534.92	5404.17	-4.08	0.17
127-1-W1-IGT2	6539	5404	6535.05	5404.69	-3.95	0.69
127-1-R1	6539	5404	6535.7	5405.86	-3.3	1.86
127-1-R2	6539	5405	6535.76	5406.16	-3.24	1.16
127-2-W1-MGreen	6651	5533	6654.2	5542.94	3.2	9.94
127-2-W2-Mred	6651	5533	6651.86	5540.75	0.86	7.75
127-2-B1	6652	5533	6647.85	5538.09	-4.15	5.09
127-3-R1	6567	5401	6562.85	5411.75	-4.15	10.75
127-4-R1	6579	5409				
127-4-W1-IGT6	6580	5409	6570.43	5416.35	-9.57	7.35
127-4-W2-IGT5	6580	5409	6571.56	5418.19	-8.44	9.19
127-5-R1	6564	5423	6575.08	5417.71	11.08	-5.29
127-5-B1	6564	5423	6575.06	5417.84	11.06	-5.16
127-6-B1	6565	5389	6567.62	5393.55	2.62	4.55
Mkr 13	6565	5389	6567.08	5393.29	2.08	4.29
127-6-B2	6565	5389	6565.83	5392.27	0.83	3.27
127-6-B3	6562	5386	6561.6	5390.25	-0.4	4.25
127-7-B1	6559	5374	6558.71	5378.86	-0.29	4.86
139-1-R1	6543	5400	6539.62	5402.58	-3.38	2.58
139-Toaster1	6540	5405	6539.62	5403.56	-0.38	-1.44
139-Toaster 2	6568	5413	6568.09	5413.44	0.09	0.44
139-2-R1	6637	5549	6636.69	5549.11	-0.31	0.11
139-2-W1-IGT5	6637	5549	6636.86	5549.5	-0.14	0.5
139-2-W2-IGT6	6637	5549	6637.09	5549.4	0.09	0.4

139-2-R2	6637	5549	6637.1	5549.4	0.1	0.4
139-3-B1	6614	5537	6614	5537.16	0	0.16
128-1-R1	7925	7958	7914.63	7945.84	-10.37	-12.16
128-1-R2	7925	7958	7913.19	7947.41	-11.81	-10.59
Mkr18	7931	7945	7933.21	7952.74	2.21	7.74
128-2-R1	7931	7945	7933.26	7952.98	2.26	7.98
128-3-W1-IGT8	7894	8015	7886.77	7999.16	-7.23	-15.84
128-3-W2-IGT7	7894	8015	7886.91	7999.21	-7.09	-15.79
Mkr 19	7894	8015	7887.06	7999.26	-6.94	-15.74
128-3-R1	7894	8015	7886.37	8001.56	-7.63	-13.44
128-3-W3-Mred	7894	8015	7886.51	8001.51	-7.49	-13.49
128-3-W4-Mgreen	7894	8015	7886.65	8001.59	-7.35	-13.41
128-3-B1	7894	8015	7887.73	8001.62	-6.27	-13.38
128-3-B2	7894	8015	7882.7	8006.83	-11.3	-8.17
128-4-B1	7872	8018	7859.51	8015.33	-12.49	-2.67
Mkr 15	7873	8017	7858.14	8015.3	-14.86	-1.7
128-4-B2	7873	8017	7859.15	8014.98	-13.85	-2.02
128-4-W1-IGT3	7872	8017	7857.61	8014.54	-14.39	-2.46
128-4-W2-IGT4	7872	8017	7858.43	8015.64	-13.57	-1.36
128-4-B3	7872	8015	7854.28	8012.06	-17.72	-2.94
128-4-B4	7870	8014	7856.66	8012.24	-13.34	-1.76
128-4-B5	7870	8014	7856.85	8013.31	-13.15	-0.69
128-5-R1	7896	8005	7883.01	8002.88	-12.99	-2.12
128-5-R2	7895	8005	7883.11	8003.34	-11.89	-1.66
128-6-B1	7906	7998	7894.89	7996.3	-11.11	-1.7
128-7-R1	7831	7797	7821.1	7793.77	-9.9	-3.23
128-8-R1	7850	7783	7840.83	7771.99	-9.17	-11.01
128-8-R2	7850	7783	7844.32	7766.17	-5.68	-16.83
Mkr 16	7850	7783	7844.32	7766.17	-5.68	-16.83
Mkr 17	7826	7751	7818.69	7743.26	-7.31	-7.74
129-1-R1	7652	7461	7652.23	7464.75	0.23	3.75
129-1-W1-IGT3	7652	7461	7652.95	7464.62	0.95	3.62
129-1-W2-IGT4	7652	7461	7652.92	7464.28	0.92	3.28
Mkr 20	7652	7461	7650.05	7460.74	-1.95	-0.26
129-1-R2	7654	7455	7654.74	7456.24	0.74	1.24
129-1-R3	7668	7455	7667.76	7455.59	-0.24	0.59
129-2-B1	7714	7412	7705.3	7420.72	-8.7	8.72
129-3-R1	7853	7771	7845.5	7769.92	-7.5	-1.08
129-3-W1-IGT5	7853	7771	7844.4	7777.36	-8.6	6.36
129-3-W2-IGT6	7853	7771	7845.56	7777.76	-7.44	6.76
Mkr 21	7833	7757	7830.03	7758.65	-2.97	1.65
129-4-R1	7827	7756	7822.17	7761.48	-4.83	5.48
129-5-W1-IGT1	7834	7759	7828.46	7761.89	-5.54	2.89
129-6-W1-IGT2	7826	7756	7825.42	7760.04	-0.58	4.04
136-2-R1	7761	7816	7761.6	7817.8	0.6	1.8
136-2-W1-IGT5	7761	7816	7764.3	7818.53	3.3	2.53
136-3-W1-Mred	7895	8015	7888.14	8011.98	-6.86	-3.02
136-4-B1	7524	6914	7448.43	6976.68	-75.57	62.68

136-4-R1	7524	6914	7444.86	6981.05	-79.14	67.05
136-5-W1-IGT4	7650	7402	7644.27	7406.85	-5.73	4.85
136-5-W2-IGT6	7650	7402	7644.2	7406.92	-5.8	4.92
136-5-R1	7650	7415	7651.03	7411.29	1.03	-3.71
136-5-B1	7650	7402	7645.31	7403.23	-4.69	1.23
136-6-R1	7642	7398	7623.13	7414.28	-18.87	16.28
132-1-R1	1492	2929	1492.66	2928.6	0.66	-0.4
132-1-W1-IGT1	1493	2929	1492.92	2927.97	-0.08	-1.03
132-1-R2	1493	2929	1492.92	2927.97	-0.08	-1.03
Mkr 14	1493	2928	1493.28	2928.38	0.28	0.38
132-2-W1-IGT3	1472	2890	1472.03	2889.99	0.03	-0.01
132-3-B1	1567	3046	1560.7	3041.13	-6.3	-4.87
132-4-W1-IGT7	1567	3046	1557.31	3043.02	-9.69	-2.98
Mkr 24	1566	3047	1565.22	3046.52	-0.78	-0.48
132-5-RB1	1557	3047	1554.84	3044.39	-2.16	-2.61
132-6-RB1	1570	3047	1569.84	3047.38	-0.16	0.38
132-7-B1	1568	3041	1567.89	3041.35	-0.11	0.35
Mkr 25	1574	2996	1574.16	2996.15	0.16	0.15
132-8-R1	1574	2996	1573.82	2995.3	-0.18	-0.7
132-8-W1-IGT5	1574	2996	1563.48	2987.68	-10.52	-8.32
132-9-R1	1515	2992	1514.62	2992.1	-0.38	0.1
132-9-R2	1515	2992	1515.58	2990.9	0.58	-1.1
132-10-R1	1532	2946	1533.96	2948.16	1.96	2.16
132-11-R1	1537	2931	1537.01	2932.41	0.01	1.41
132-12-R1	1531	2927	1531.01	2926.46	0.01	-0.54
132-13-R1	1529	2912	1536.19	2916.28	7.19	4.28
132-14-W1-IGT6	1486	2841	1485.57	2840.75	-0.43	-0.25
132-14-R1	1486	2841	1485.51	2840.67	-0.49	-0.33
132-15-R1	1481	2841	1480.59	2842.19	-0.41	1.19
132-16-B1	1516	2893	1516.08	2893.02	0.08	0.02
134-1-R1	1566	2769	1565.99	2769.2	-0.01	0.2
134-2-R1	1565	2768	1565.14	2768.6	0.14	0.6
134-3-W1-Mgreen	1479	2875	1469.81	2885.74	-9.19	10.74
134-3-W1-Mred	1479	2875	1470.37	2887.13	-8.63	12.13
134-4-R1	1479	2880	1471.29	2889.46	-7.71	9.46
134-5-W1-IGT5	1572	2999	1568.28	2999.36	-3.72	0.36
134-6-B1	1568	3065	1567.66	3064.43	-0.34	-0.57
134-7-W1-IGT3	1599	3181	1597.63	3181.63	-1.37	0.63
134-7-W2-IGT6	1614	3177	1614.08	3177.07	0.08	0.07
134-7-R1	1599	3181	1614.98	3176.58	15.98	-4.42
Mkr 22	1599	3181	1614.9	3176.35	15.9	-4.65
134-8-R1	1599	3181	1608.7	3190.57	9.7	9.57
134-8-R2	1599	3181	1605.88	3194.57	6.88	13.57
134-9-R1	1599	3198	1597.1	3198.51	-1.9	0.51
134-9-W1-IGT4	1599	3198	1599.05	3198.11	0.05	0.11
134-10-R1	1602	3215	1602.13	3214.62	0.13	-0.38
Mkr 26	1602	3215	1602.24	3214.64	0.24	-0.36
134-11-RB1	1590	3207	1590.76	3207.52	0.76	0.52

138-1-W1-IGT2	1594	3225	1594.31	3224.52	0.31	-0.48
138-1-W2-IGT4	1594	3225	1594.23	3223.83	0.23	-1.17
138-2-R1	1595	3226	1594.87	3226.28	-0.13	0.28
138-3-R1	1573	3226	1572.38	3226.61	-0.62	0.61
138-4-R1	1576	3234	1574.81	3233.5	-1.19	-0.5
138-5-R1	1577	2994	1577.44	2994.23	0.44	0.23
138-6-W1-IGT6	1573	3040	1572.25	3040.62	-0.75	0.62
138-7-R1	1529	2983	1528.58	2983.12	-0.42	0.12
138-7-W1-IGT7	1529	2983	1523.28	2987.21	-5.72	4.21
138-7-W2-IGT8	1529	2983	1522.6	2987.33	-6.4	4.33
138-8-R1	1534	2931	1533.98	2932.23	-0.02	1.23
138-9-B1	1521	2924	1521.12	2924.96	0.12	0.96
138-10-R1	1576	2906	1575.49	2906.21	-0.51	0.21
130-1-W1-IGT1	5027	5831	5033.15	5831.03	6.15	0.03
130-1-W2-IGT2	5027	5831	5033.7	5831.16	6.7	0.16
130-1-W3-Mred	5027	5831	5034.48	5830.93	7.48	-0.07
130-1-W4-Mgreen	5027	5831	5033.13	5831.32	6.13	0.32
130-1-R1	5027	5831	5032.65	5832.15	5.65	1.15
130-1-R2	5027	5831	5032.88	5832.21	5.88	1.21
131-1-W1-IGT7	4966	5764	4944.39	5746.26	-21.61	-17.74
131-1-W2-IGT8	4966	5764	4946.53	5747.8	-19.47	-16.2
131-1-R1	4966	5764	4958.06	5757.02	-7.94	-6.98
131-2-W1-IGT3	5003	5856	5004.69	5857.67	1.69	1.67
131-2-W2-IGT4	5003	5856	5002.56	5857.56	-0.44	1.56
131-2-B1	5002	5855	5007.81	5856.64	5.81	1.64
131-3-RB1	5004	5848	5004.5	5848.69	0.5	0.69
131-4-W1-IGT5	5071	5885	5070.11	5878.87	-0.89	-6.13
131-4-W2-IGT6	5071	5885	5070.02	5879.02	-0.98	-5.98
131-4-B1	5071	5885	5069.94	5879.08	-1.06	-5.92
131-4-R1	5071	5885	5069.95	5878.92	-1.05	-6.08
131-5-R1	5036	5925	5036.01	5927.4	0.01	2.4
131-6-R1(RB1)	5057	5927	5052.85	5927	-4.15	0
131-7-R1	4980	5864	4975.3	5869.53	-4.7	5.53
131-8-R1	4983	5859	4974.51	5867.65	-8.49	8.65
135-1-W1-IGT7	4981	5838	4978.54	5837.19	-2.46	-0.81
135-1-W2-IGT8	4981	5838	4978.36	5837.12	-2.64	-0.88
135-2-W1-IGT1	4974	5834	4973.64	5834.25	-0.36	0.25
135-3-B1	5021	5794	4972.13	5823.57	-48.87	29.57
135-4-B1	4909	5753	4907.22	5760.56	-1.78	7.56
135-5-W1-IGT2	5057	5887	5059.7	5882.62	2.7	-4.38
135-5-RB1	5057	5887	5060.02	5883.84	3.02	-3.16
133-1-B1	4341	2114	4337.49	2105.59	-3.51	-8.41
133-1-W1-IGT7	4341	2114	4340.53	2109.61	-0.47	-4.39
133-1-W2-IGT8	4341	2114	4341.85	2111.53	0.85	-2.47
133-2-R1/R2	4288	1819	4282.26	1819.54	-5.74	0.54
133-3-R1	4254	1885	4255.27	1884	1.27	-1
133-4-R1	4259	1908	4256.81	1910.06	-2.19	2.06
133-5-W1-IGT4	4275	1951	4277.36	1955.29	2.36	4.29

133-5-W2-IGT3	4275	1951	4277.39	1956.22	2.39	5.22
133-5-R1	4275	1951	4276.43	1956.54	1.43	5.54
133-6-W1-IGT2	4290	1972	4284.18	1971.93	-5.82	-0.07
133-6-W2-IGT1	4290	1972	4284.63	1972.26	-5.37	0.26
135-6-B1	4341	2114	4344.4	2113.85	3.4	-0.15
135-6-RB2	4341	2114	4344.26	2115.03	3.26	1.03
135-7-W1-Mgreen	4289	1973	4291.72	1970.61	2.72	-2.39
135-7-W2-Mred	4289	1973	4286.65	1970.5	-2.35	-2.5
135-8-R1	4290	1973	4289.78	1969.75	-0.22	-3.25
135-9-R1	4279	1954	4278.41	1954.84	-0.59	0.84
135-10-R1	4282	1945	4282.26	1945.65	0.26	0.65