Brothers Volcano
March 6-26, 2018
R/V Thomas Thompson, ROV Jason

TN350 Cruise Report

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Summary of Activities and Sample Collection

We departed Auckland on 6 March 2018 on the R/V *Thomas Thompson* with the remotely operated vehicle (ROV) *Jason* onboard, and arrived on site at Brothers volcano one day later on 7 March. There were a total of five *Jason* deployments (Dives #1037-1041) with nine days lost to weather or technical issues. Thirteen thermal blanket and thirty-one thermal probe measurements provided a comprehensive dataset of heat flux at Brothers volcano from the NW Caldera rim, along the caldera floor, and up the flanks of the Upper and Lower Cone sites. Fourteen Major water samples and fourteen Isobaric Gas-Tight (IGT) samples were taken for geochemical analysis of the fluids. Water samples were taken at almost every site where mineralized samples were collected. A total of thirty rocks and/or mineral (usually chimney) samples were collected and described. All high-temperature chimney samples were sub-sampled and the microbial DNA extracted. In addition to *Jason*-related operations, during weather days we conducted three different magnetometer surveys and four CTDO (conductivity-temperature-depth-optical) deployments. The newly surveyed uppermost part of the Upper Caldera wall was sampled and mapped using the Reson multibeam sonar.

**Additional Activities.** In addition to the day-to-day operations, science meetings were conducted on a daily basis. During transits, scientific presentations were given by Cornel de Ronde, Lucy Stewart, Gilberto Flores, and Alex Diehl, and were open to all the crew and scientific party. We also maintained a website of the cruise at the newly upgraded Dive and Discover site (divediscover.whoi.edu). Data can be obtained from the *Jason* Virtual Van (http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn350/index.html).

Acknowledgements

The success of this cruise reflects the efforts of many people on shore and at sea. First and foremost, Susan Humphris wishes to sincerely thank Anna-Louise Reysenbach for stepping in on short notice as Chief Scientist and assuming responsibility for successfully meeting the science objectives, despite the challenges encountered along the way!

Preparations for the cruise were complicated by the delay in completion of the refit of the R/V *Thomas Thompson*. We wish to thank the University of Washington Marine Operations Office staff, and in particular, Doug Russell, for their tireless efforts to get the ship to Auckland for our cruise. Much of the success of the cruise itself relied on the teamwork of the entire shipboard party, the scientists, the *Jason* team, and the crew. We thank Captain Eric Haroldson and the officers and crew of the R/V *Thomas Thompson*, and Ben Trudd and the *Jason* team, for their dedication to completing the scientific objectives of the cruise. We gratefully acknowledge the efforts of the shipboard technicians, Patrick A’Hearn and Steve Jalickee, for their tireless assistance. Much of the science at sea could not have been done without the logistics and equipment support from collaborators at GNS, New Zealand. We also thank the New Zealand government for providing us the access permit to do the research.

This work was funded by the US National Science Foundation and through the support of GNS by the New Zealand government.
Cruise Objectives

Volcanic arcs are the surface expression of magmatic systems that result from the subduction of mostly oceanic lithosphere at convergent plate boundaries. Arcs with a submarine component include intraoceanic arcs and island arcs that span almost 22,000 km on Earth’s surface, with the vast majority located in the Pacific region. It is estimated that all intraoceanic arcs combined may contribute hydrothermal emissions equal to ~10% of that from mid-ocean ridges (MORs).

The Kermadec segment of the Kermadec-Tonga intraoceanic volcanic arc has at least thirty-two prominent volcanoes of which 80% are hydrothermally active, making it one of the most active arcs in the world. Hydrothermal activity associated with these arc volcanoes is often magmatically-dominated, in contrast to mid-ocean ridge vent systems, which are dominated by seawater circulation through basaltic oceanic crust. This magmatic hydrothermal signature, coupled with the shallow depths of these volcanoes and high volatile contents, heavily influences the chemistry of the fluids and the mineralization that results from these fluids, and likely has important consequences for the biota associated with these systems. Given the high metal contents and very acidic fluids, these hydrothermal systems are also thought to be important analogs of many porphyry copper and epithermal gold rich deposits mined on land today.

The cruise focused on testing several hypotheses relating to the geometry of hydrothermal circulation at Brothers, the heat and chemical fluxes, and the role of low pH, magmatic volatile-rich hydrothermal fluids on the formation of sulfides, rock alteration, microbial diversity and metabolic pathways in this hydrothermal system. An important secondary objective was to assess potential sites for drilling by the International Ocean Discovery Program (IODP) in May-July 2018 through which we hope to extend our seafloor observations and measurements into the subseafloor to ultimately address overarching questions regarding hydrothermal vent systems hosted in arc volcano settings.

The specific cruise goals were therefore to collect data and samples to:

- Document the magnitude of conductive heat flux through the caldera floor
- Map and image the hydrothermal vent fields and areas around the proposed IODP drill sites
- Determine the volcanic stratigraphy at Brothers through detailed caldera floor-to-rim mapping and sampling
- Investigate the relation between vent fluid chemistry, mineralization, and the composition of the vent microbiology.

Summary of ROV Jason Dives

Dive 1037 (03/8/2018: ~6 hours bottom time)

Prior to the dive, it was evident that the power onboard the R/V Thompson was not clean, creating issues with the Jason van, including the wall air conditioners in the van. Once this issue was considered resolved, operations commenced. The elevator was deployed on a winch near the proposed IODP drill site on the rim of the NW Caldera.
As part of Dive 1037, which was officially an engineering dive, we requested that some science objectives be accomplished; i.e., deployment of heat blankets, and detailed mapping of the recently discovered (January 2017) hydrothermally active area on the Upper Caldera walls, above the rim of the NW Caldera walls.

After initial deployment, a ground fault in the AVTRAK was detected, Jason was brought back onboard, the issue resolved, and then Jason was redeployed. Once on site, three blankets were collected from the elevator and deployed in the NW Caldera rim area. A further two blankets were then collected and deployed. It then became clear there were unpredictable power issues affecting the Jason winch operations, so the dive had to be aborted.

It was determined that the newly configured and overhauled R/V Thompson power supply was extremely unreliable and dirty, and could not support Jason operations. We returned to Auckland to rent a temporary generator for Jason operations.

**Dive 1038 (03/14-16: ~24 hours bottom time)**

Jason was deployed on the rim above the NW Caldera area near the elevator site, and the blankets that had been deployed on Dive 1037 were retrieved and re-deployed at new sites in the Upper Caldera area and along the caldera rim separating the latter from the NW Caldera area. In between these activities, two diffuse venting flanges were sampled that were discharging fluids between ~42 and 55 °C. High temperature water samples and chimney samples were also collected, and a HOBO probe was left in one of the vents. Thereafter, the Upper Caldera wall was explored, additional water and chimneys sampled, an additional HOBO probe deployed, and thermal blankets once more re-deployed in this area.

Seven chimney samples for microbiological analyses were recovered and deposited in bio boxes, and an additional three large chimney samples were obtained for geological studies. Four IGT fluid samples were obtained, and four additional fluid samples were collected with the Major water samplers. The heat flow blankets were again re-deployed, heat flow measurements were made with the heat flow probe. The five thermal blankets were retrieved at the end of the dive and transferred to the elevator for return to the surface. One of the HOBO probes was retrieved at the end of the dive.
The objectives of Dive 1039 were to: 1) document with video proposed IODP drill site WC-1A on the caldera floor; 2) transit to the NW Caldera wall to obtain more high-temperature fluids and chimneys from the vent sites perched on the wall; 3) investigate the stockwork zone previously discovered by the Quest 4000 ROV in 2017; 4) deploy and then re-deploy heat flow blankets on the wall; and 5) retrieve the HOBO probe that was left behind during Dive 1038.

The elevator containing nine heat flow blankets was deployed using a winch near proposed IODP site WC-1A. A marker was deployed at the WC-1A proposed drill site. A thermal blanket was deployed at the same site. All the remaining thermal blankets were deployed along a transect between WC-1A and the northwest caldera wall and then at the southend of the northwest caldera site. The thermal blankets were redeployed midway through the dive to obtain a second set of stations. The HOBO probe that had been inserted in a chimney in the Upper NW Caldera Rim area was recovered. Four IGT and four Major water samples of very high quality were obtained, and a fluid temperature of 318°C for one of the high-temperature fluids was recorded. All eight biochamber pots were filled and several other rocks collected. Excellent video of many of the collection sites were obtained, and we were also able to video in detail the stockwork zone (three different zones were identified) — another first for the 20 years of research done at Brothers. Additionally, we identified a small colony of tubeworms, possibly Arcovestia ivanovi, and observed several unusual deep-sea invertebrates. At the end of the dive all nine of the thermal blankets were retrieved and placed into the elevator along with two of the Major water samplers.

Although all goals were accomplished, Jason returned to the surface early, primarily because the weather forecast predicted a very rapid, stormy weather change for the afternoon, with winds >20 knots and large swells. As Jason surfaced, the weather did indeed change rapidly.

The wind and swell came up very quickly within an hour. The elevator was released from the seafloor in time to be retrieved after the recovery of Jason. The elevator was tracked from the seafloor to about 90 m before it was spotted on the surface. What followed remains unclear, but it resulted in the loss of the elevator. A twenty-four hour search commenced that continued through the night until late afternoon the next day. All nine thermal blankets and their data, two Major water samplers and their contained fluids (all belonging to GNS), a MAPR (belonging to NOAA), and other electronics associated with the elevator, were lost.
**Fig 4.** Dive 1039. A. caldera floor- Bigfin squid-- are a group of rarely seen cephalopods in the genus *Magnapinna* and family Magnapinnidae. B. Tubeworm colony, probably *Arcvestia ivanovi*. C and D. lower stock work zone. E and F sampling the chimneys on the NW caldera wall area.

**Fig 5.** Dive 1039 Jason track and sample sites
**Dive 1040 (03/16-17: ~12.5 hours bottom time)**

This dive accomplished all its primary objectives which were to: 1) conduct numerous heat probe measurements from proposed IODP site WC-1A then up, and over, the Upper Cone; 2) obtain four IGT, four major water samples, and corresponding rock and chimney samples; and 3) retrieve a thermal blanket that had been deployed in January 2017 from the pit crater to the Upper Cone. The dive was not extended because *Medea* (the tether management system for *Jason*) had an issue with its own tether.

**Figure 6.** Examples of heat probe measurements at the Cone site.

**Figure 7.** Dive 1040: Upper Cone sampling. A. Alunite deposits. B. Retrieval of thermal blanket deployed in 2017. C & D. Diffuse flow from sulfur flanges.

**Figure 8.** Dive 1040 dive track and sampling sites.
**Dive 1041 (03/23-25” ~49 hours bottom time)**

Dive 1041 took advantage of good weather conditions to obtain heat flow probe measurements at all the sites where data had not been retrieved due to loss of the heat flow blankets on the elevator. The dive started on the Lower Cone where a few water and rock samples were recovered. A marker was placed at the proposed IODP alternate drill site SEC-1A. We then headed to the NE Caldera wall to conduct a detailed survey of the rock units that make up this part of the caldera wall. Thereafter, we returned to the rim above the NW Caldera area, where we obtained the additional heat flow probe measurements, and then collected more water samples and chimney samples down the NW Caldera slope. Finally, we attempted to complete the survey of the Upper Caldera wall with the Reson multibeam. However, we were able to accomplish only about half of the survey as we could not consistently get good fixes of the seafloor using the Doppler which affected trackline following.

**Figure 9. Dive 1041 track and sampling sites**

[Images of dive tracks and sampling sites]

**Fig 10. A and B. NE Caldera wall. C and D. Stockwork zone on the NW Caldera wall**
Individual Team Shipboard Activities and Preliminary Observations

1. Underway Geophysical Surveys (Maurice Tivey and Fabio Caratori Tontini)

The R/V Thompson has a newly installed Kongsberg Simrad EM302 sonar - a high frequency (30 kHz) multibeam designed for optimum performance in water depths shallower than ~3000 m. Full beam swath widths varied between 4,000 m and 10,000 m depending on the angle settings for the beams, generally 30 to 75°. The system has 432 beams and we utilized the high density equal distance mode for the distribution of the beams. Dual swath mode was turned off and pitch stabilization was turned on. The POS-MV provided yaw stabilization information. Sound speed information was obtained from an XBT measurement within the caldera.

Multibeam data were collected on all transits to and from the Brothers site and on several geophysical surveys during weather downtime for ROV Jason operations (see Table 1). In terms of processing, the raw *.all data were converted to MB-Systems format *.mb59 files using a script and then processed in the MB System software where ping editing was done and files saved as trackline swath grids.

Fig 9. A and B. Lower cone site sulfur fumaroles and sediments with barnacles. C and D. Microbial mats on low temperature iron oxide deposits from the NW Caldera wall area.

Figure 11. A and B. Lower Cone sulfur fumaroles and sediments with barnacles. C and D. Microbial mats on lower temperature iron oxyhydroxide deposits in the NW Caldera wall area.
Table 1. Shipboard multibeam surveys conducted during cruise TN350

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A Marine Magnetics Seaspy marine magnetometer supplied by GNS Science was used to collect sea surface magnetic measurements during the cruise. The Seaspy magnetometer is an Overhauser nuclear precession type of sensor that collects total field data at a fast rate (typically during this cruise, 0.3 Hz sec rep rate) with a reported accuracy of 0.1 nT. The magnetometer was deployed by hand over the starboard side of the fantail. A 200-m-long magnetometer cable was used during for the first tow, but the cable suffered damage from spinning of the fish and was hopelessly twisted upon retrieval (although data acquisition was fine). A second, 100 m-long tow cable was used for subsequent tows. A coaxial conductor deck cable ran from the aft fantail through the hangar to the wet lab where a laptop was set up with Marine Magnetics BOB software for data acquisition. GPS navigation was taken from the ships CNAV3050 feed to the laptop. Time was manually set to GMT.

The magnetometer was used during the geophysics surveys but not during transits. The first geophysics survey was conducted at transit speeds of up to 13 kts. The subsequent tows were done at slower speeds (6 kts) due to weather conditions. A total of three geophysics surveys were completed during the cruise to fill in coverage of the GNS Science data compilation of the Kermadec arc region.

Underway marine gravity data was provided by a GNS Science-supplied gravimeter. The instrument is a Lacoste and Romberg S-80 marine gravimeter upgraded to a ZLS Ultrasys control system. Time is provided by the laptop clock, which was synchronized to the GPS signal taken from the ship. Data were recorded on a laptop at a 1 Hz data rate with hourly files.
2. Heat Flow Measurements (Maurice Tivey and Fabio Caratori Tontini)

A primary objective of the geophysical program was to obtain heat flux measurements across the caldera, including measurements at the various proposed IODP drill sites. The original plan for the heat flow measurements was to use thermal blankets (GNS Science provided nine) supplemented by heat flow probe measurements using the recently updated NDSF Heat Flow Probe (HFP).

Thermal blankets allow seafloor thermal gradient measurements to be made in areas of sparse sediment cover and bare rock outcrops where more conventional heat flow probes are unable to penetrate into the seafloor. Thermal blankets consist of an open cell foam material covered by a porous fabric in the shape of a disk approximately 0.5 m in diameter (Figure 12). The thermal blankets have a motorcycle inner tube filled with seawater and a ring of lead shot to provide the ballast weight and ability for the blanket to conform to the seafloor morphology in order to provide a good seal (Figure 13). Autonomous recording milli-degree precision thermistor sensors manufactured by Antares are located on the top and bottom of the blanket providing the basis for the thermal gradient measurement. The thermistor on the bottom of the blanket equilibrates with the underlying seafloor while the top thermistor equilibrates with the overlying seawater. A typical minimum time for equilibration is approximately 8 hours between separate measurement locations.

In order to provide a calibration of the thermal blankets measurements, we also planned to use the NDSF Heat Flow Probe, which is inserted into the seafloor by the ROV manipulator (Figures 14 and 15). This 60-cm-long probe has been upgraded from the original Alvin heat flow probe and consists of nine thermistors spaced 5 cm apart along the probe length. The first thermistor is located 11.5 cm from the tip with succeeding thermistors spaced 5 cm up the probe. The probe also incorporates a heater wire that can provide a known heat flow pulse in order to estimate \textit{in situ} thermal conductivity. A typical measurement consists of inserting the probe into the seafloor and waiting between 8 to 10 minutes for the frictional heat of insertion to dissipate; then a heat pulse can be fired, followed by another 8 to 10 minute measurement period before retracting the probe. Thus, a total heat flow probe measurement takes approximately 20-25 minutes. The heat flow probe was installed and carried on all of the ROV \textit{Jason} dives. The software was modified from the original Alvin heat flow program. The was some confusion about how to set the various settings on the heat flow GUI, which resulted in a couple of stations not properly firing a heat pulse of sufficient time. This is only a problem for the first few HFP stations.

Figure 12. A stack of thermal blankets being prepared for deployment.
Five thermal blankets were sent down on an elevator to be deployed on the first ROV *Jason* dive 1037 at the NW Caldera hydrothermal site. Problems with the ship’s power meant that the ROV dive ended before we had a chance to recover, or move, the blankets to a new measurement location. On the following dive 1038, we were able to move the blankets to a second measurement location in the NW Caldera area (See Table 1 for deployment locations). At the end of Dive 1038, the blankets were returned to the surface by elevator for data download. For the next dive 1039, all nine thermal blankets were sent down on the elevator to the West Caldera site. The blankets were distributed across the caldera floor and up the caldera wall toward the NW Caldera site. The blankets were moved once during the dive to a second set of measurement locations. Due to incoming weather, the blankets were retrieved and shuttled to the elevator, which was subsequently lost at the surface. Hence, all the data collected during the dive 1039 were lost. This also meant that we no longer had any thermal blankets left with which to make measurements. We were then forced to maximize the use of the NDSF Heat Flow Probe (HFP), which provided a more than adequate substitute.

Two HFP measurements were made during *Jason* dive 1038 at two previous thermal blanket sites (for which we had data) as a calibration. Two further HFP measurements were made during *Jason* dive 1039. In addition, a total of eight HFP measurements were made during *Jason* dive 1040 and a further nineteen HFP measurements were made on *Jason* Dive 1041 for a total of thirty-one HFP stations (Table 2). In the end, we were able to obtain sufficient heat flow measurements using both the thermal blankets and HFP to provide a comprehensive coverage of the caldera.
Table 2. Thermal Blanket stations

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* Thermal blanket F recovered during Jason dive 1040 but deployed during the 2017 Sonne 2017 ROV Quest cruise.

Table 3. Heat Flow Probe stations

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<td>J2-1040-2-HF1</td>
<td>3/21/18</td>
<td>23:32</td>
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<td>9332</td>
<td>1202</td>
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<td>11234</td>
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<td>-52.2538</td>
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<td>4.4626</td>
<td>11777</td>
<td>1604</td>
<td>SEC-1A</td>
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</table>
3. Thermal HOBO Probe Deployments (Maurice Tivey)

High temperature thermocouple loggers (also known as HOBOs) supplied by Dan Fornari (WHOI-MISO group) were deployed at two vent locations at the NW Caldera site to measure the long-term variation in vent temperature (Table 3). The probes were deployed at the same location as a suite of fluid and chimney samples was obtained. One HOBO probe was deployed on Jason Dive 1038 and recovered approximately 16 hours later on the same dive. A second HOBO probe was deployed on Jason dive 1038 and recovered on Jason dive 1039 approximately 36 hours later. Unfortunately, we were not able to deploy any other HOBO probes at the Cone sites because of scheduling issues with the dive plan, and the fact that any subsequent dives would not be revisiting any of the Cone vent sites.

Table 4. HOBO temperature probe deployments

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:05 Mar 14</td>
<td>Dive 1038: Deploy HOBO hi-T temperature probe white/red in vent:</td>
</tr>
<tr>
<td>04:05 Mar 15</td>
<td>J2-1038-6-TC/RED/WHITE</td>
</tr>
<tr>
<td></td>
<td>Event # 1249; depth: 1319 m</td>
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<tr>
<td></td>
<td>lat: 34.75173’ S</td>
</tr>
<tr>
<td></td>
<td>lon: 179 3.116164’ E</td>
</tr>
<tr>
<td></td>
<td>IGT and Major water samplers deployed: temperature 279°C</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-IGT3</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-MAJ-WHITE</td>
</tr>
<tr>
<td>07:21 Mar 15</td>
<td>Dive 1038: Retrieve HOBO RED/WHITE</td>
</tr>
<tr>
<td>20:21 Mar 15</td>
<td></td>
</tr>
<tr>
<td>00:33 Mar 15</td>
<td>Dive 1038: Deploy hobo hiT temperature probe at same site</td>
</tr>
<tr>
<td></td>
<td>Event # 2584; depth: 1582 m</td>
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<td></td>
<td>lat: 34.75173’ S</td>
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<td></td>
<td>lon: 179 3.438628’ E</td>
</tr>
<tr>
<td></td>
<td>Chimney sample J2-1038-13-R7</td>
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</table>

J2-1041-20-HF1 3/23/18 15:36 -34 -51.6322 179 4.0953 13728 1592
J2-1041-32-HF1 3/24/18 5:19  -34 -51.6499 179 3.5894 14628 1589
J2-1041-33-HF1 3/24/18 6:19  -34 -51.4660 179 3.5694 14777 1454
4. Hydrothermal Vent Fluid Chemistry (Valerie Stucker, Sean Sylva, Alex Diehl)

A. Gas-tight fluid samples

Fluids were collected using titanium isobaric gas-tight (IGT) fluid samplers. In some cases, two gas-tight samples were collected at each edifice. The IGT samplers are equipped with thermocouples that allow for real-time temperature measurement during collection of fluids. Communication with the IGT samplers is achieved via an inductively coupled link (ICL) that allows RS-232 communication. Reported temperature for each IGT fluid sampler represents the maximum temperature recorded while the thermocouple/snorkel tip was inserted in the vent orifice prior to, during, or after sampling.

Fluid samples were processed within ten hours of vehicle recovery. Sub-samples were extracted from the IGT bottles for measurement of pH (25°C), dissolved gases, and major cation and anion analyses. The aliquot for trace metal analyses (~25 ml) was acidified with 0.025 ml of ultra-pure HNO₃. Small aliquots of fluid were archived for strontium isotope analysis. Aliquots were archived in evacuated glass containers for shore-based determination of the abundance of CO₂. Following complete removal of the fluid from the samplers, solid precipitates were removed from the bottle by rinsing with water. The water was then allowed to evaporate leaving the solid precipitates.

A Metrohm 780 pH meter was used for measuring pH (25°C). To minimize loss of acid volatiles, samples were not sparged with an inert gas during measurement. Attainment of stable pH values indicated that significant sulfide oxidation was not occurring during measurement, notwithstanding the absence of an inert gas overlying the sample. Dissolved H₂ and CH₄ concentrations were measured on board by gas chromatography (GC) following a headspace
extraction in a purpose-built inlet system. The GC was equipped with a 5Å molecular sieve column, nitrogen carrier gas, and a thermal conductivity detector for H₂ analysis and a PoraPlot-Q phase column, nitrogen carrier gas, and a flame ionization detector for CH₄ analysis.

Table 5. Summary of samples collected during cruise TN350

<table>
<thead>
<tr>
<th>ROV Dive #</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Depth [m]</th>
<th>Bathy</th>
<th>Heading</th>
<th>T_max [°C]</th>
<th>pH</th>
<th>Alk meq/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>34 51.475265 S</td>
<td>179 3.115850 E</td>
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<td>79.29</td>
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<tr>
<td>J2-1038</td>
<td>34 51.475201 S</td>
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<td>272.8</td>
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<tr>
<td>J2-1038</td>
<td>34 51.690254 S</td>
<td>179 3.438608 E</td>
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<td>329.64</td>
<td>303.7</td>
<td>2.76</td>
<td>-1.4</td>
<td></td>
</tr>
<tr>
<td>J2-1038</td>
<td>34 51.663163 S</td>
<td>179 3.446765 E</td>
<td>1581.75</td>
<td>293.45</td>
<td>243.8</td>
<td>3.22</td>
<td>-0.6</td>
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</tr>
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<td>J2-1039</td>
<td>34 51.718224 S</td>
<td>179 3.539292 E</td>
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<td>337.51</td>
<td>320.5</td>
<td>3.27</td>
<td>-0.6</td>
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</tr>
<tr>
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<td>179 3.539322 E</td>
<td>1599.47</td>
<td>336.94</td>
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<td>4.47</td>
<td>0.3</td>
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<tr>
<td>J2-1039</td>
<td>34 51.756684 S</td>
<td>179 3.472928 E</td>
<td>1617.51</td>
<td>318.69</td>
<td>301.9</td>
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<td>-0.5</td>
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<tr>
<td>J2-1040</td>
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<td>179 4.093937 E</td>
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<td>311.33</td>
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<tr>
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<td>179 4.095599 E</td>
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<td>61.1</td>
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</table>

B. Major fluid samples

Two titanium syringe samplers (Major samplers) were used to collect fluids directly from actively venting sites during the Jason dives. The sample nozzle was placed into the discharging stream of the vent fluid. The observation of fluids being expelled from the hole above the nozzle entrance indicated that hot vent fluid was indeed passing up the nozzle. Temperature was obtained from the IGT sampling that immediately preceded the Major water sampling. Following equilibration, the hydraulic trigger on the ROV arm was used to open the Major samplers and draw in fluid. The venting hole on the sampler was again checked that it was discharging hydrothermal fluid once the trigger was released, to verify that the sampler nozzle was still in the fluid flow, and that hydrothermal fluid would be entering the Major sampler. The sampler was then returned to its storage location in a sliding drawer under the ROV.

Table 6. Splits taken from the titanium Major water samplers

<table>
<thead>
<tr>
<th>Sample purpose</th>
<th>Volume (mL)</th>
<th>Container</th>
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<td>Gas concentrations</td>
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<td>Gas tight syringe</td>
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<tr>
<td>Alkalinity/acidity</td>
<td>20</td>
<td>Syringe</td>
</tr>
<tr>
<td>Metals, trace and major</td>
<td>125</td>
<td>125 mL round bottle</td>
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<tr>
<td>Water isotopes</td>
<td>15</td>
<td>15 mL falcon tube</td>
</tr>
<tr>
<td>Silica/working bottle</td>
<td>30</td>
<td>60 mL pink vials</td>
</tr>
<tr>
<td>Nutrients</td>
<td>30</td>
<td>30 mL bottle</td>
</tr>
<tr>
<td>Anions</td>
<td>30</td>
<td>30 mL bottle</td>
</tr>
<tr>
<td>Sulfur/archive</td>
<td>125</td>
<td>125 mL bottle</td>
</tr>
<tr>
<td>Dregs/particle analysis</td>
<td>5+ if present</td>
<td>50 mL Tube</td>
</tr>
</tbody>
</table>

Preliminary shipboard chemistry results are presented below in Table 3. Upper Caldera samples had both higher and lower salinity when compared to seawater (i.e., 35‰), with both samples having a pH lower than 3. The NW Caldera site sampled many times previously had salinities near seawater, and ranged in pH from 7.6 down to 2.8. The highest measured sulfide content was in a sample with pH of 3.3. The Upper Cone had the lowest pH samples, ranging from 2.0 to 2.2.
These are not record low pH values, but nevertheless are still low. Salinity for these samples was near seawater values, while some sulfide was present in the samples.

Lower Cone samples were very gassy, and are likely to be dominated by CO2 given previous sampling, with one very high alkalinity sample (5.76 meq/L) measured from a 60°C sample. This sample also had the highest sulfide concentration for the Lower Cone.

### Table 7. Summary of samples and analyses from Major water samplers.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Date</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Depth</th>
<th>Max T</th>
<th>pH</th>
<th>Alkalinity</th>
<th>Salinity</th>
<th>Sulfide</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>meq/L</td>
<td>‰</td>
<td>mg/L</td>
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<td></td>
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<td>179 3.10784 E</td>
<td>1319</td>
<td>279</td>
<td>2.965</td>
<td>-0.96</td>
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<td>42</td>
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<td>J2-1038-15-MAJ-red</td>
<td>15/03/2018</td>
<td>34 51.54988 S</td>
<td>179 3.03578 E</td>
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<td><strong>NW caldera inside rim</strong></td>
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<tr>
<td>J2-1038-13-MAJ-yellow</td>
<td>15/03/2018</td>
<td>34 51.71436 S</td>
<td>179 3.38785 E</td>
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<td>303</td>
<td>2.824</td>
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<td>J2-1038-14-MAJ-green</td>
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<td>34 51.69312 S</td>
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<td>14.92</td>
</tr>
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<td><strong>Lower Cone</strong></td>
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<td></td>
<td></td>
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<tr>
<td>J2-1041-6-MAJ-green</td>
<td>24/03/2018</td>
<td>34 54.38776 S</td>
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<td>2.51</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

### 5. Diffuse Fluids Microbiology (Lucy Stewart)

Diffuse fluids were sampled on each dive using the Major water samplers and divided for chemistry and gas analyses, microbial incubations, and filtration for DNA extraction. Microbial incubations focused on counting thermophilic anaerobes in diffuse samples (autotrophic iron-reducers, sulfur-reducers, and methanogens, and heterotrophic sulfur-reducers) using most-probable-number analyses (MPNs); microcosm incubations to assess carbon sources for thermophilic methanogens; and testing the growth of thermophilic methanogens at low pH values. Microcosm incubations were also replicated using media and successful incubations filtered to assess the affect of media additives (e.g., vitamins) on methanogen community composition.

Table 8 lists that samples taken, experiments conducted, and preliminary results. Remaining diffuse fluids after core chemical analyses and microbial incubations were filtered onto Sterivex filters, which were immediately frozen at -80°C. These will be used for DNA extraction and metagenomic sequencing onshore. Full analysis of microbial growth and metabolite production
will also be completed onshore, as well as sequencing of methanogenic microcosm incubations. All incubations were carried out at 70°C, except where otherwise noted.

**Table 8. Microbiological activity experiments**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Site</th>
<th>Temperature (°C)</th>
<th>pH</th>
<th>Incubations</th>
<th>Filtered for DNA?</th>
<th>Preliminary notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CTD</strong></td>
<td>Seawater above plume</td>
<td>4</td>
<td>7.9</td>
<td>Heterotrophic sulfur-reducers only (control)</td>
<td>No</td>
<td>No growth</td>
</tr>
<tr>
<td>J2-1038-14-MAJ-Green</td>
<td>Northwestern caldera, microbial mats with diffuse venting</td>
<td>8.1</td>
<td>7.62</td>
<td>MPNs at 70 and 85°C, microcosm incubations, pH tests</td>
<td>Yes – 150mL</td>
<td>Iron reduction and sulfur reduction detected at 85°C, heterotrophic sulfur reduction at 85 and 70°C</td>
</tr>
<tr>
<td>J2-1039-16-MAJ-Red</td>
<td>Northwestern caldera, small low-temp chimney</td>
<td>42</td>
<td>6.52</td>
<td>MPNs, microcosm incubations, pH tests</td>
<td>Yes – 165 mL</td>
<td>Methanogenesis detected supported by H₂ only, sulfur reduction detected &lt;24 hr incubation on ship; further incubation needed in home lab</td>
</tr>
<tr>
<td>J2-1041-7-MAJ-Blue</td>
<td>Diffuse venting at Lower Cone site with microbial mats/sulfur</td>
<td>16</td>
<td></td>
<td>MPNs, microcosm incubations, pH tests</td>
<td>Yes – 125 mL</td>
<td>&lt;24 hr incubation on ship; further incubation needed in home lab</td>
</tr>
<tr>
<td>J2-1041-4-IGT8</td>
<td>Focused venting at Lower Cone with lots of sulfur</td>
<td>61</td>
<td></td>
<td>MPNs and pH tests</td>
<td>No</td>
<td>&lt;24 hr incubation on ship; further incubation needed in home lab</td>
</tr>
</tbody>
</table>

6. Rock and Molecular Microbiological Collections
(Gilberto Flores, Anna-Louise Reysenbach and Cornel de Ronde)

Rock/chimney/deposits collected during the *Jason* dives are presented in Table 9 and are individually described in the Appendix. DNA from sulfide/rock and other deposits was extracted at sea using the MoBio soil DNA kit following the modified protocol of the Reysenbach laboratory.
Table 9. Rock and chimney deposit descriptions

<table>
<thead>
<tr>
<th>SampleID</th>
<th>Event</th>
<th>Date</th>
<th>Lat</th>
<th>Long</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038-3-R1</td>
<td>896</td>
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<tr>
<td>J2-1038-4-R2</td>
<td>952</td>
<td>3/14/18 12:56</td>
<td>-34.858887</td>
<td>179.050305</td>
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<tr>
<td>J2-1038-5-R3</td>
<td>1110</td>
<td>3/14/18 14:05</td>
<td>-34.85792</td>
<td>179.051933</td>
<td>1319.25</td>
</tr>
<tr>
<td>J2-1038-6-R4</td>
<td>1126</td>
<td>3/14/18 14:11</td>
<td>-34.857913</td>
<td>179.051935</td>
<td>1319.26</td>
</tr>
<tr>
<td>J2-1038-12-R5</td>
<td>2172</td>
<td>3/14/18 21:35</td>
<td>-34.861055</td>
<td>179.057429</td>
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<tr>
<td>J2-1038-12-R6</td>
<td>2249</td>
<td>3/14/18 22:44</td>
<td>-34.86105</td>
<td>179.05746</td>
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<td>J2-1038-13-R7</td>
<td>2512</td>
<td>3/15/18 0:02</td>
<td>-34.861509</td>
<td>179.0573</td>
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<td>J2-1038-13-R8</td>
<td>2590</td>
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<tr>
<td>J2-1038-15-CH1</td>
<td>3377</td>
<td>3/15/18 6:24</td>
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<tr>
<td>J2-1038-15-CH2</td>
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<td>3/15/18 6:25</td>
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<td>J2-1039-10-R1</td>
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<tr>
<td>J2-1039-14-CH1</td>
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<td>J2-1039-14-CH2</td>
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<tr>
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<tr>
<td>J2-1040-10-CH2</td>
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<td>3/22/18 8:13</td>
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<td>-34.878866</td>
<td>179.071394</td>
<td>1329.87</td>
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</tbody>
</table>

7. CTD and MAPR Operations (Sharon Walker and Cornel de Ronde)

Hydrothermal plumes at Brothers volcano were mapped during TN350 using the ship’s CTD and Niskin bottle sampling rosette (24 x 10 L bottles). The CTD was a Seabird 911plus system with
dual, ducted temperature-conductivity sensors, two dissolved oxygen sensors (model SBE-43), and a Valeport (VA-500) altimeter. Additional analog sensors for optical backscatter (two high-sensitivity Seapoint turbidity meters) and oxidation-reduction-potential (one NOAA/PMEL ORP sensor) were supplied by Sharon Walker (NOAA/PMEL) and integrated with the system.

Two CTD tow-yos and two vertical cast were completed. Time between ROV dives was limited, and bad weather further reduced the opportunity to do more; however, the operations that were completed will significantly add to the two-decade long effort by GNS Science and NOAA to investigate the long-term variability of the distribution, intensity, and chemistry of the above-bottom plumes at Brothers volcano.

Discrete water samples (20) were taken during each CTD tow for shipboard or shorebased analyses of $^3\text{He}/^4\text{He}$ (11), pH (41), CH$_4$ (3), total dissolved metals (9), and microbiology (7). (Number after analyses type indicates how many subsamples were taken for each analysis)

A PMEL Miniature Autonomous Plume Recorder (MAPR) was mounted on ROV Jason for all dives. The MAPR measured temperature, pressure, optical backscatter, and ORP. The optical backscatter and ORP sensors on the MAPR are identical to those integrated with CTD. The descent/ascent portion of all ROV dives provided additional full water column profiles of these properties to supplement the CTD plume mapping efforts. The MAPR also provided information about the physio-chemical properties along the near-bottom portions of all dives. The last several hours of Jason dive 1041 were dedicated to completing a high-resolution multibeam survey, at 70 or 30 m above bottom, over the N-NW rim, upper wall and slope outside the caldera. Plume distributions were mapped during this survey as well.

**Table 10. CTD two-yos and vertical casts conducted during cruise TN350**

<table>
<thead>
<tr>
<th>Cast</th>
<th>Station Name</th>
<th>Latitude (S)</th>
<th>Longitude (E)</th>
<th>Start time</th>
<th>End time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V18A-01</td>
<td>34° 51.9660'</td>
<td>179° 3.7180'</td>
<td>08-Mar-2018 06:32</td>
<td>08-Mar-2018 07:56</td>
</tr>
<tr>
<td></td>
<td>start</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>end</td>
<td>34° 54.0660'</td>
<td>179° 4.5820'</td>
<td>20-Mar-2018 05:04</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>T18A-02</td>
<td>34° 53.9060'</td>
<td>179° 3.1880'</td>
<td>22-Mar-2018 12:12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>start</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>end</td>
<td>34° 51.3450'</td>
<td>179° 5.6330'</td>
<td>22-Mar-2018 17:11</td>
<td></td>
</tr>
</tbody>
</table>
Figure 17. Map of Brothers volcano showing CTD tow track lines (white lines) and vertical cast locations (yellow square).
APPENDIX I
Scientific Personnel/Responsibilities

*R/V Thomas Thompson Captain:* Eric Haroldson
*Chief Scientist:* Anna-Louise Reysenbach

*TGT Scientific Marine Technicians:* Patrick A’Hearn and Steve Jalickee

*Jason Group Team*

*Expedition Leader:* Ben Tradd
Andy Billings
Alberto Collasius
Molly Curran
Jon Howland
Chris Judge
Akel Kevis-Stirling
Chris Lathan
James Pelowski
Korey Verhein

*Watch Leaders/ Virtual Van/ Video*
Fabio Caratori-Tontini/ Laura Rea/ Monika Swick
Cornel de Ronde/ Anna Wietelmann/ Vanessa Schenker
Maurice Tivey/ Sam Nadell/ Lucy Stewart and Sharon Walker

*Sample/Data Collection Lead Scientists*

*Geophysics:* Maurice Tivey, Fabio Caratori-Tontini
*Microbiology:* Anna-Louise Reysenbach, Gilbert Flores, Lucy Stewart
*Geology:* Cornel de Ronde, Vanessa Schenker
*Geochemistry:* Sean Sylva, Valerie Stucker, Alex Diehl
*CTD:* Cornel de Ronde and Susan Walker

*Students (Jason van data loggers, watchstanders; general helpers):*
Sam Nadell (Cornel)
Laura Rea (Whitman)
Anna Wietelmann (Stanford)
Vanessa Schenker (ETH)
Monika Swick (UW)

*Outreach*
*Dive and Discover:* Eric Olsen
*Making Movies Documentary Company:* Scott Mouat
APPENDIX II

ROV Jason Dive Plans

Dive 1037 Plan: NW Caldera Rim—Engineering Dive

- When on station, deploy elevator first on a wire.

Elevator landing site: -34.86086 °S, 179.054017 °E

Elevator deployment with Cassius, five thermal blankets. If navigation not good, will need to do a Cassius USBL calibration (about 8 hrs), after which Jason can be deployed. If Cassius calibration not required, then after elevator deployment, Jason in.

Jason launch coordinates: Close to elevator launch

Objectives:

Engineering Dive. Jason team operations have priority

This should take about 8 hours. Once completed;

- Proceed to the elevator and pick up five blankets, investigate the high temperature site (NW Caldera rim) for good heat flow measurement sites, deploy blankets at sites determined by Fabio and Maurice,

- Once blankets deployed, map Upper Caldera site. Using the following coordinates, develop a multibeam (Reson) survey grid for this unmapped area, ~60 m off bottom, ~ 200 m line spacing:
  - W corner - 34.8590°S, 179.041 °E
  - N corner - 34.8493°S, 179.0527°E
  - E corner - 34.8557°S, 179.0590°E
  - S corner - 34.8649°S, 179.0470°E

- Test new heat flow probe. Also, starboard magnetometer may need some monitoring,

- If all going well, survey area, video, take two Majors and possibly chimney (4) samples. For chimneys, take sample, then measure temperature, unless IGT first then use the IGT to measure the temperature

- Collect thermal blankets and place in elevator and

- Return elevator to surface.

<table>
<thead>
<tr>
<th>Jason</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAPR</td>
</tr>
<tr>
<td>CTD, 2 magnetometers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jason basket</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 IGTs</td>
</tr>
<tr>
<td>Rock box with dividers</td>
</tr>
<tr>
<td>1 sidearm: biobox (port)</td>
</tr>
<tr>
<td>Hi Temp probe</td>
</tr>
<tr>
<td>4 chamber pots</td>
</tr>
<tr>
<td>Heat flow probe</td>
</tr>
<tr>
<td>1 sidearm 2: Majors</td>
</tr>
</tbody>
</table>

Elevator: Five thermal blankets, MAPR
Dive 1038 Plan: Upper Caldera site and NW Caldera site

Launch *Jason* at Elevator landing site: -34.86086°S, 179.054017°E

Objectives:
- Redeploy and retrieve blankets
- Heat flow probe measurements
- Deploy and retrieve two Hobo probe,
- Sample up to eight flanges and chimneys. Preferably four from the Upper Caldera site and four from the upper NW Caldera site
- Obtain two pairs of IGTs, one high temperature fluid pair from Upper Caldera site and one high temperature pair from upper NW Caldera site.

*For all chimney and flange sampling, ALR or Gilbert should be in the van.*
*For all IGT samples Sean should be in the van.*

1. Proceed to the elevator, remove some weights (elevator maintenance).

**Upper Caldera Site:**
2. Move and redeploy the two blankets (TB-1, TB-2) at sites determined by Fabio and Maurice.
3. Take a chimney sample and place in chamber pot. Check the temperature of the fluid after each sample (this can be done using the IGT probe if that water sample is taken).
4. Take an IGT pair from this same orifice. IGT samples are always taken in pairs.
5. Take a Major water sample.
6. Deploy a Hobo probe in this orifice.
7. Take a second chimney sample and two flange samples, and place in chamber pots. Check the temperature of the fluid after each sample.
8. Cornel may need a rock? Place in box with sampled IGTs or behind chamber pots.
10. Move and redeploy the TB-3, TB-4 and TB-5 (probably near caldera rim or upper region of caldera wall).
11. Move to NW Caldera site.

**NW Caldera site (upper part):**
1. Take a chimney sample and place in chamber pot. Check the temperature of the fluid after each sample (this can be done using the IGT probe if that water sample is taken).
2. Take an IGT pair from this same orifice.
3. Take a major water sample.
4. Deploy a Hobo probe in this orifice.
6. Take a three additional chimney samples and place in chamber pots. Check the temperature of the fluid after each sample.
7. Take a second Major from one of these sites, Valerie to decide where.
8. Sample rocks for Cornel as needed.

**Clean-up:**
9. Once sampling is complete, retrieve Hobo probes from both sites and place in elevator.
10. Collect thermal blankets and place in elevator or in Jason first.
11. Return to surface.
12. Return elevator to surface.

<table>
<thead>
<tr>
<th>Jason</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAPR, CTD, 2 magnetometers</td>
</tr>
<tr>
<td>Jason Basket:</td>
</tr>
<tr>
<td>2 Hobo probes</td>
</tr>
<tr>
<td>4 IGTS</td>
</tr>
<tr>
<td>8 chamber pots</td>
</tr>
<tr>
<td>Rock box</td>
</tr>
<tr>
<td>2 sidearms with 2 majors each</td>
</tr>
<tr>
<td>Hi Temp probe</td>
</tr>
<tr>
<td>Heat flow probe</td>
</tr>
</tbody>
</table>
Dive 1039 Plan: Caldera floor, NW Caldera wall

Launch *Jason* and Elevator: -34.87527°S, 179.05857°E

Objectives:
- Obtain video footage of IODP site WC-1A and deploy a marker
- Deploy (and retrieve) nine heat blankets around the IODP site towards the NW Caldera wall and up the wall
- Obtain video footage of the NW Caldera wall stockwork zone seen during the R/V *Sonne* cruise in January 2017
- Sample chimneys and water immediately above and below stockwork zone and then proceed towards the caldera floor.

*For all chimney and flange sampling, ALR or Gilbert should be in the van.*

*For all IGT samples, Sean should be in the van.*

1. Land at the IODP site WC-1A.
2. Deploy the marker 1. Obtain ~10 minutes of good video survey of the area.
3. Proceed to elevator and pick up five thermal blankets.
4. Place the thermal blankets on a transect as determined by Fabio and Maurice.
5. Return to elevator and retrieve the remaining four blankets and continue blanket deployment towards and up the NW Caldera wall.
6. Take a careful video traverse and survey of the previously discovered ~40 m wide x 15 m high stockwork zone (have Cornel in the van for this!)
7. Take samples from the stockwork veins and place in the blue divided milk crate.
8. Proceed to the chimneys immediately above the stockwork area, and take a chimney sample, paired IGTs and a Major water sample.
9. Obtain up to three more chimney samples in the area, taking temperature readings after each collection. Obtain another Major at one of these collection sites.
10. Proceed further up the NW Caldera wall and retrieve the Hobo probe that was deployed there. Event 2584: 34°51.714354’S, 179°3.387708°E.
11. Return to the caldera floor via the base of the stockwork zone, and collect up to four chimneys, one collection with paired IGTs and a major.
12. If diffuse fluids are noted, return to the elevator to pick up a Major, for another diffuse flow sample for Lucy. Alternatively, if any more Major samples are desired, take these as per Valerie and Cornels’ direction.
13. Finish dive by retrieving all the blankets and placing them in the elevator.
14. Return the elevator to the surface.
<table>
<thead>
<tr>
<th><strong>Jason</strong></th>
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</tr>
</thead>
<tbody>
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<tr>
<td>4 IGTs</td>
<td></td>
</tr>
<tr>
<td>8 chamber pots</td>
<td></td>
</tr>
<tr>
<td>Rock box</td>
<td></td>
</tr>
<tr>
<td>2 sidearms with 2 majors each</td>
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</tr>
<tr>
<td>Marker #1</td>
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<tr>
<td>Hi Temp probe</td>
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<tr>
<td>Heat flow probe</td>
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</table>
**Dive 1040 Plan: Caldera Floor to Upper and Lower Cones**

*Jason launch coordinates*: 34°52.2270’S, 179°3.5124’E

**Objectives:**
- Heat probe measurements on NW Cone slope and towards lower cone
- Four discrete IGT and Major sample pairs
- Chimney/rock associated with water samples.

1. At landing, start taking heat flow measurements at sites determined by Fabio and Maurice. At each site, measure for 20 minutes.
2. Once at the top of the Cone, recover the heat flow blanket at the summit. Take a heat-flow measurement (34°52.9260’S 179°4.0980’E).
3. On the summit of the Upper Cone, there are white smokers; take one discrete water sample. One IGT, one Major, one chimney (approx. location 34°52.9500’S, 179°4.0982’E).
4. Explore east and northeast side of the plateau and take one Major sample, one IGT, one chimney.
5. Continue down the flank towards the Lower Cone site. Take heat flow probe measurements (as directed by Fabio and Maurice).
6. At Lower Cone, take additional chimneys, two IGT Major samples, two discrete water and paired chimney samples. (Approx. Location: 34°52.734’S, 179°4.2636’E and 34°52.7316’S, 179°4.2792’E)
7. Additional heat probe measurements at Lower Cone as directed by Fabio and Maurice.
8. Return to the surface.

<table>
<thead>
<tr>
<th><strong>Jason Basket:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 rock boxes, one with divider</td>
</tr>
<tr>
<td>4 IGTs</td>
</tr>
<tr>
<td>Hi Temp probe</td>
</tr>
<tr>
<td>8 chamber pots</td>
</tr>
<tr>
<td>Heat flow probe</td>
</tr>
</tbody>
</table>

Proposed heat flow probe stations
- #1 179°3.5124’E -34 -52.2270’S (*Jason* landing)
- #2 179°3.7416’E -34 -52.7436’S
- #3 179°3.9786’E -34 -52.7382’S
- #4 179°3.9306’E -34 -52.9134’S
- #5 179°4.0674’E -34 -52.9362’S
- #6 179°4.1244’E -34 -52.9614’S
- #7 179°4.1802’E -34 -52.8420’S
- #8 179°4.2930’E -34 -52.7040’S
Dive 1041 Plan: Lower Cone, NE wall and Rim, back to NW Caldera Rim

Jason launch coordinates: 179.06676°E, -34.87298°S (179°4.006'E, 34°52.3788’S)

Objectives

- Heat probe measurements on Lower Cone and flanks, and follow-up probe measurements at NW Caldera site
- Four discrete IGTs, Major sample pairs (one diffuse flow Major)
- Chimney/rock associated with water samples
- Slurp bacterial mats
- NE Caldera wall video transect for volcanic stratigraphy and rock sampling
- Multibeam mapping survey of Upper Caldera site

1. Land on northern spur ridge of Lower Cone. Take a heat flow probe measurement and then move south up the flank of the Lower Cone, taking heat flow probe measurements at sites determined by Fabio and Maurice. At each site, measure for 20 minutes.
2. At the top of the cone, take an IGT, four Major samples, and chimney/rock sample, SLURP.
3. Take another heat flow measurement at Lower Cone summit.
4. Proceed down the northeastern flank of the Lower Cone and take one heat flow probe measurement.
5. Move to the IODP drill site SEC-1A drill site (179.081069°E, -34.876105°S). Deploy a marker, take a heat-flow probe measurement.
6. Proceed towards the north flank of the Lower Cone. Take a heat-flow measurement.
7. Proceed across caldera floor to the NE Caldera wall. At base, take a heat flow measurement.
8. Video survey up the caldera wall - collect representative rocks where needed. Take heat-flow stations at the following locations:
   - 179.07268°E, -34.86510°S
   - 179.07467°E, -34.86273°S
   - 179.07594°E, -34.86163°S
9. At summit of NE Caldera wall, take two heat flow probe measurements and then traverse wall rim over to the NW Caldera site.
10. In NW Caldera area, take heat probe measurements as indicated.
11. If there are empty IGTs, take samples and chimneys here. SLURP here.
12. If time permits, map the Upper Caldera wall area with multibeam sonar (~8 hrs)
13. Return to the surface.

<table>
<thead>
<tr>
<th>Jason Basket:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 rock boxes, one with divider</td>
</tr>
<tr>
<td>4 IGTs</td>
</tr>
<tr>
<td>Hi Temp probe</td>
</tr>
<tr>
<td>4 chamber pots</td>
</tr>
<tr>
<td>Heat flow probe</td>
</tr>
<tr>
<td>Slurp gun</td>
</tr>
<tr>
<td>2 sidearms - 4 Majors</td>
</tr>
<tr>
<td>RESON multibeam sonar</td>
</tr>
</tbody>
</table>
APPENDIX III

Cruise Log TN-350

Note: Local time: 13 hrs ahead GMT

<table>
<thead>
<tr>
<th>GMT</th>
<th>Local Time</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>01:00</td>
<td>14:00</td>
<td>Departed Auckland.</td>
</tr>
<tr>
<td>Mar 6</td>
<td>Mar 6</td>
<td></td>
</tr>
<tr>
<td>jd=65</td>
<td>jd=65</td>
<td></td>
</tr>
<tr>
<td>02:00</td>
<td>15:00</td>
<td>Pilot disembarks&lt;br&gt;Ship is transiting to the first waypoint at Brothers volcano&lt;br&gt;179.054017°E -34.86086°S</td>
</tr>
<tr>
<td>Mar 6</td>
<td>Mar 7</td>
<td>Slow the ship – we are about 1 hr away from site.&lt;br&gt;We have a ship’s power issue with Jason.&lt;br&gt;We will be doing a power switch over to another clean power circuit for the Jason van. Requires power turned off to all science labs and sensor systems, incl. multibeam, satellite comms, email, etc.</td>
</tr>
<tr>
<td>19:30</td>
<td>08:30</td>
<td>Clean power back on in the labs</td>
</tr>
<tr>
<td>Mar 6</td>
<td>Mar 7</td>
<td>Install and lower USBL pole from ship</td>
</tr>
<tr>
<td></td>
<td>Mar 7</td>
<td>Elevator in water – being lowered on CTD wire</td>
</tr>
<tr>
<td>02:27</td>
<td>15:27</td>
<td>Elevator released&lt;br&gt;179.054017°E -34.86086°S&lt;br&gt;Very close to proposed IODP drill site location in Northwest Caldera area</td>
</tr>
<tr>
<td>Mar 7</td>
<td>Mar 7</td>
<td>Start USBL survey&lt;br&gt;Seems to be a good calibration, so only need to verify settings.</td>
</tr>
<tr>
<td>11:04</td>
<td>00:04</td>
<td>Launch Jason&lt;br&gt;&lt;i&gt;Jason&lt;/i&gt; in the water&lt;br&gt;&lt;b&gt;START JASON DIVE 1037&lt;/b&gt;</td>
</tr>
<tr>
<td>Mar 7</td>
<td>Mar 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(jd 67)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mar 7</td>
<td>&lt;i&gt;Jason&lt;/i&gt; at 100 m. Have a ground fault on AVTRAK. Will need to recover Jason.</td>
</tr>
<tr>
<td></td>
<td>Mar 8</td>
<td>Medea back on deck</td>
</tr>
<tr>
<td>11:54</td>
<td>00:54</td>
<td>Recover Jason – Jason back on deck&lt;br&gt;Replace faulty AVTRAK</td>
</tr>
<tr>
<td>Mar 7</td>
<td>Mar 8</td>
<td>Jason back in the water&lt;br&gt;DIVE 1037 continued</td>
</tr>
<tr>
<td>15:00</td>
<td>04:00</td>
<td>Stop winch at 700 m depth for Maggie calibration spin&lt;br&gt;Spin CW 1 degree/sec</td>
</tr>
<tr>
<td>15:39</td>
<td>04:39</td>
<td>Spin CCW</td>
</tr>
<tr>
<td>15:50</td>
<td>04:50</td>
<td>End mag calibration spin</td>
</tr>
<tr>
<td>15:57</td>
<td>04:57</td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td>05:30</td>
<td>&lt;i&gt;Jason&lt;/i&gt; on bottom: 1458 m</td>
</tr>
<tr>
<td>Mar 7</td>
<td>Mar 8</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
<td>Details</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>16:46</td>
<td>Spotted XBT weight on seafloor 1460 m</td>
<td>Lat: 34°51.647444'S, Lon: 179°3.235184'E</td>
</tr>
<tr>
<td>16:48</td>
<td>Marker in sight: depth 1461 m</td>
<td>Lat: 34°51.652306'S, Lon: 179°3.237283'E, Note: this likely to be IODP marker 6; see later 19:54</td>
</tr>
<tr>
<td>16:48</td>
<td>Elevator in sight</td>
<td></td>
</tr>
<tr>
<td>16:51</td>
<td>At elevator: depth 1461 m</td>
<td>Lat: 34°51.657425'S, Lon: 179°3.239415'E</td>
</tr>
<tr>
<td>16:52</td>
<td>Retrieve thermal blankets A/B/C from elevator</td>
<td></td>
</tr>
<tr>
<td>17:15</td>
<td>Deploy thermal blanket TB-A</td>
<td>J2-1037-1-TB-A; event #110; depth 1447 m, Lat: 34°51.606386'S, Lon: 179°3.197541'E</td>
</tr>
<tr>
<td>17:45</td>
<td>Deploy thermal blanket TB-B on steep slope</td>
<td>J2-1037-2-TB-B; event# 160, Lat: 34°51.560637'S, Lon: 179°3.133384'E</td>
</tr>
<tr>
<td>18:31</td>
<td>Deploy thermal blanket TB-C</td>
<td>J2-1037-3-TB-C; event# 224; depth 1296 m, Lat: 34°51.533345'S, Lon: 179°2.975265'E</td>
</tr>
<tr>
<td>18:50</td>
<td>Drive back to elevator</td>
<td></td>
</tr>
<tr>
<td>19:37</td>
<td>At elevator – retrieve two remaining thermal blankets D and E and move off to deploy these.</td>
<td></td>
</tr>
<tr>
<td>19:54</td>
<td>At IODP marker #6; depth 1461 m</td>
<td>Lat: 34°51.652076'S, Lon: 179°3.240377'E</td>
</tr>
<tr>
<td>20:59</td>
<td>Deploy thermal blanket TB-D</td>
<td>J2-1037-4-TB-D; event #383; depth 1399 m, Lat: 34°51.647429'S, Lon: 179°2.974070'E</td>
</tr>
<tr>
<td>21:08</td>
<td>A/C in Jason van stops working</td>
<td></td>
</tr>
<tr>
<td>21:28</td>
<td>Deploy thermal blanket TB-E</td>
<td>J2-1037-5-TB-E; event #414; depth 1449 m, Lat: 34°51.694789'S, Lon: 179°3.086842'E</td>
</tr>
<tr>
<td>22:23</td>
<td>Winch stopped working – remote control unit not working and brake is not working. Reson multibeam electronics is not working – overheating electronics in the rack. Note A/C is out in the van – electronics getting hot.</td>
<td></td>
</tr>
<tr>
<td>02:41</td>
<td>Winch fixed temporarily, but systems are not working properly. Decide to bring Jason up</td>
<td></td>
</tr>
<tr>
<td>03:30</td>
<td>Jason back on deck</td>
<td></td>
</tr>
<tr>
<td>04:00</td>
<td>Prepare to run a CTD</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Action/Details</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>06:38 Mar 8</td>
<td>Do a vertical CTD cast over caldera floor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V18A-01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>179°03’ 43.06’E (179.061961)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-34°51’ 57.95’S (-34.866097)</td>
<td></td>
</tr>
<tr>
<td>07:56 Mar 8</td>
<td>CTD deployed</td>
<td></td>
</tr>
<tr>
<td>13:30 Mar 8</td>
<td>Spin the ship with EM302 over the top of Brothers</td>
<td></td>
</tr>
<tr>
<td>14:20 Mar 8</td>
<td>Finished spin – move the ship south 1 mile and repeat spin with EM302</td>
<td></td>
</tr>
<tr>
<td>14:30 Mar 8</td>
<td>Move south to do another spin</td>
<td></td>
</tr>
<tr>
<td>15:20 Mar 8</td>
<td>Begin EM302 spin over southern Brothers caldera and cone site</td>
<td></td>
</tr>
<tr>
<td>16:00 Mar 8</td>
<td>Finished spin</td>
<td></td>
</tr>
<tr>
<td>20:00 Mar 8</td>
<td>Will set up to do underway geophysics survey south towards Auckland.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waypoints as follows:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Longitude, E                Latitude, S                Waypoint</td>
<td></td>
</tr>
<tr>
<td></td>
<td>178 54.3954             -34°53.1186             1 start</td>
<td></td>
</tr>
<tr>
<td></td>
<td>178 43.2839              -34°57.1482              2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>178 31.6836              -35. 6.0618               3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>178 17.2752              -35 20.4708               4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>178 4.6980               -35 43.7928               5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>178 0.5466               -35 49.6542               6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>177 57.0054              -35 52.7064                7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>177 48.4578              -36 3.0858                 8 end survey</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recover towed sea surface magnetometer at the end of the survey</td>
<td></td>
</tr>
<tr>
<td>21:18 Mar 8</td>
<td>Magnetometer deployed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ship underway ~12.6 kts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EM302 multibeam and NZ gravity meter are running</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Estimated 7 hr 20 min duration</td>
<td></td>
</tr>
<tr>
<td>05:10 Mar 9</td>
<td>End of survey line</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Magnetometer recovered on board.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maggie cable has a horrible twist in the cable. Cable is unusable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>We will not do the CTD Tow-yo as we will head directly to Auckland.</td>
<td></td>
</tr>
<tr>
<td>05:20 Mar 9</td>
<td>Now heading directly to Auckland to get a stand alone power generator for Jason.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Major storm (cyclone Hola) is forecast for Brothers area and south and so we have to leave anyway. The cyclone is due to hit Auckland as well over the late weekend into Monday.</td>
<td></td>
</tr>
<tr>
<td>19:05 Mar 9</td>
<td>Driving through Hauraki Gulf towards Auckland</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pilot is on board and we are heading for Auckland harbor</td>
<td></td>
</tr>
<tr>
<td>20:00 Mar 9</td>
<td>At the dock, Auckland – Freyberg Quay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Generator for Jason is here at the dock</td>
<td></td>
</tr>
<tr>
<td>22:01 Mar 11</td>
<td>At the dock, Auckland</td>
<td></td>
</tr>
</tbody>
</table>
Rain from storm Hola finally arriving this a.m. Not much wind. Blows through by 10:30 pm

At the dock, Auckland
Plan is to depart at 23:59 local

Depart Auckland harbor

In transit to Brothers volcano

Arrive on site at Brothers

Deploy USBL pole

BEGIN JASON Dive 1038
Deploy Jason at elevator site
Lat: -34°51.6516'S
Lon: 179°03.2410'E

Medea deployed - going down with Jason
Stop at 745 m for magnetometer calibration spins

Jason on bottom

Recover thermal blanket A: depth 1447 m
Lat: 34°51.606154'S
Lon: 179°3.198389'E

Recover thermal blanket B: depth 1383 m
Lat: 34°51.559552'S
Lon: 179°3.132536'E

Now move off to redeploy blankets

ReDeploy blanket A 1038-1-TB-A: depth 1352 m
Lat: 34°51.447425'S
Lon: 179°3.141308'E

ReDeploy blanketB 1038-2-TB-B 1321 m
Lat: 34°51.501180'S
Lon: 179°3.048382'E

Chimney flange sample – put in POT
J2-1038-3-R1  depth 1301 m
Lat: 34°51.534751'S
Lon: 179°3.005755'E
Flange opening temperature 42°C

Chimney sample from small beehive in POT-8
J2-1038-6-R4  (Note: This is the same station as station 5)
Bottom part fell to seafloor (will retrieve later)

Gas-tight water sample at same chimney
J2-1038-6-IGT3  Temperature: 279°C
<table>
<thead>
<tr>
<th>Time</th>
<th>Action</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:33</td>
<td>Gas-tight water sample (second sample) J2-1038-6-IGT4</td>
<td>Temperature: 272°C</td>
</tr>
<tr>
<td>14:57</td>
<td>Major water sample at the same vent site J2-1038-6-MAJ-WHITE</td>
<td></td>
</tr>
<tr>
<td>15:05</td>
<td>Deploy HOBO hi-T temperature probe white/red in vent</td>
<td>1038-6-TC/red/white, Event # 1249, depth: 1319 m, lat: 34°51.476250′ S, lon: 179°3.108366′ E</td>
</tr>
<tr>
<td>15:50</td>
<td>Heat Flow Probe measurement at thermal blanket C site</td>
<td>J2-1038-7-HF1, depth 1297 m, lat: 34°51.533566′ S, lon: 179°2.976365′ E</td>
</tr>
<tr>
<td>16:47</td>
<td>Finished heat flow measurement, retrieve blanket C</td>
<td>lat: 34°51.533336′ S, lon: 179°2.976224′ E</td>
</tr>
<tr>
<td>17:33</td>
<td>Retrieve thermal blanket D</td>
<td>lat: 34°51.646147′ S, lon: 179°2.974106 E</td>
</tr>
<tr>
<td>18:05</td>
<td>At thermal blanket E, retrieve blanket</td>
<td>lat: 34°51.691661′ S, lon: 179°3.088627′ E</td>
</tr>
<tr>
<td>18:25</td>
<td>Finished heat flow probe measurement, now move off to redeploy the thermal blankets</td>
<td>J2-1038-8-HF2, depth 1449 m</td>
</tr>
<tr>
<td>18:56</td>
<td>Redeploy thermal blanket C</td>
<td>J2-1038-9-TB-C, depth: 1465 m, lat: 34°51.734557′ S, lon: 179°3.228263′ E</td>
</tr>
<tr>
<td>19:33</td>
<td>Deploy thermal blanket D</td>
<td>J2-1038-10-TBD, depth: 1488 m, lat: 34°51.682366′ S, lon: 179°3.339113 E</td>
</tr>
<tr>
<td>20:06</td>
<td>Redeploy thermal blanket E</td>
<td>J2-1038-11-TB-E, depth: 1570 m, lat: 34°51.651154′ S, lon: 179°3.431846 E</td>
</tr>
<tr>
<td>21:35</td>
<td>Crumbled beehive chimney pieces placed in POT-4</td>
<td>J2-1038-12-R5, depth: 1582 m, lat: 34°51.663299′ S, lon: 179°3.445754′ E</td>
</tr>
<tr>
<td>22:08</td>
<td>Gas-tight water sample</td>
<td>J2-1038-12-IGT6, Temperature 243°C, Decided not to take second IGT here as too unstable</td>
</tr>
<tr>
<td>22:45</td>
<td>Dead chimney sample placed in IGT 3&amp;4 basket</td>
<td>J2-1038-12-R6, depth: 1580 m</td>
</tr>
<tr>
<td>Time</td>
<td>Date</td>
<td>Event Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>00:02</td>
<td>Mar 15</td>
<td>Move off to look for a diffuse sample location – test several shimmering water sites</td>
</tr>
<tr>
<td>13:02</td>
<td>Mar 15</td>
<td>Black smoker chimney sample placed in POT-2 J2-1038-13-R7: depth 1582 m</td>
</tr>
<tr>
<td>00:11</td>
<td>Mar 15</td>
<td>Gas-tight water sample at same site J2-1038-13-IGT5: Temperature 303°C Note van says site 14 but is 13</td>
</tr>
<tr>
<td>13:11</td>
<td>Mar 15</td>
<td>Major water sample at same site as IGT J2-1038-13-MAJ-YELLOW</td>
</tr>
<tr>
<td>00:23</td>
<td>Mar 15</td>
<td>Deploy hobo HiT temperature probe at same site 1038-13-HOBO-TC RED/BLACK Event # 2584: depth: 1582 m</td>
</tr>
<tr>
<td>13:33</td>
<td>Mar 15</td>
<td>Chimney sample (placed in port blue bin) 1038-13-R8 piece that fell to the ground earlier Note van says R7 but is R8.</td>
</tr>
<tr>
<td>00:38</td>
<td>Mar 15</td>
<td>Check shimmering water patch temperature Temperature 37°C</td>
</tr>
<tr>
<td>03:12</td>
<td>Mar 15</td>
<td>Stop at another shimmering water site Max temp is 65+°C</td>
</tr>
<tr>
<td>03:22</td>
<td>Mar 15</td>
<td>Move to another white patch of shimmering water Take temperature (value not recorded in Van)</td>
</tr>
<tr>
<td>03:39</td>
<td>Mar 15</td>
<td>Finished sampling, move off to pickup blanket</td>
</tr>
<tr>
<td>03:52</td>
<td>Mar 15</td>
<td>Retrieve thermal blanket TB-E</td>
</tr>
<tr>
<td>04:13</td>
<td>Mar 15</td>
<td>Retrieve blanket D but lost blanket E as it slid downhill!</td>
</tr>
<tr>
<td>04:18</td>
<td>Mar 15</td>
<td>Retrieved lost blanket E</td>
</tr>
<tr>
<td>03:39</td>
<td>Mar 15</td>
<td>Temperature probe measurement of 187°C</td>
</tr>
<tr>
<td>04:46</td>
<td>Mar 15</td>
<td>Retrieved blanket C</td>
</tr>
<tr>
<td>04:49</td>
<td>Mar 15</td>
<td>Head towards elevator</td>
</tr>
<tr>
<td>05:04</td>
<td>Mar 15</td>
<td>Put all three thermal blankets in the elevator</td>
</tr>
<tr>
<td>06:15</td>
<td>Mar 15</td>
<td>Temperature probe measurement of 187°C</td>
</tr>
<tr>
<td>06:24</td>
<td>Mar 15</td>
<td>Chimney sample (large!) from active smoker (in HOBO box) J2-1038-15-CH-1: depth 1331 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chimney sample in POT-1 same location J2-1038-15-CH-2</td>
</tr>
<tr>
<td>07:21</td>
<td></td>
<td>Retrieve HOBO RED/WHITE</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
<td></td>
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<tr>
<td>--------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>07:59</td>
<td>Retrieve thermal blanket A</td>
<td></td>
</tr>
<tr>
<td>08:23</td>
<td>Retrieve thermal blanket B – now go to elevator</td>
<td></td>
</tr>
<tr>
<td>09:07</td>
<td>At the elevator, place blankets in box on elevator</td>
<td></td>
</tr>
<tr>
<td>09:47</td>
<td>Problem releasing elevator. It appears the release arm is hitting the wooden box and not dropping all the way.</td>
<td></td>
</tr>
</tbody>
</table>
| 09:50  | Elevator released and coming to surface      
|        | ETA 50 min  
|        | *Jason* is on its way up as well                                     |
| 09:53  | *Jason* off bottom                                                   |
| 10:49  | Elevator at surface but there is a strong surface current.           |
|        | Ship has a hard time closing on elevator. Ship has to drive ~ 2 kts, with *Jason* and *Medea* in the water streaming behind to close distance on the elevator. |
| 11:24  | Elevator finally hooked and lifted on deck                           |
| 11:52  | *Medea* on deck                                                       |
| 12:01  | *Jason* on deck                                                       |
| 18:29  | Prep for elevator launch – 9 thermal blankets and 2 major water samplers on board |
| 18:45  | Elevator launched at WC-1A site  
|        | Lat: 34.87527°E 179.05856°S                                           |
| 22:52  | Elevator finally hooked and lifted on deck                           |
| 23:47  | *Jason* in the water                                                 |
| 23:50  | *Medea* in the water                                                 |
| 01:20  | *Jason* on bottom                                                    |
| 01:51  | Find an open sedimented area                                          |

**JASON DIVE 1038**

We will reconfigure the elevator and process all the samples from the *Jason* basket.

**JASON DIVE 1039**

Launch *Jason*  
WC-1A target  
Lat: 34°52.5162’S  
Lon: 179°3.5142’E  

Ground on IGT ICLs. Need to recover *Jason* and fix *Jason* back on deck.  
The ICL is replaced and the dive can begin.  

**START JASON DIVE 1039**

Launch *Jason*  
WC-1A target  
Lat: 34°52.5162’S  
Lon: 179°3.5142’E  

*Head back to elevator and get Thermal blanket A*
<table>
<thead>
<tr>
<th>Time</th>
<th>Action</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>01:58</td>
<td>At elevator - pickup thermal blanket A and deploy nearby</td>
<td></td>
</tr>
<tr>
<td>02:02</td>
<td>Deploy Thermal Blanket A</td>
<td>J2-1039-1-TB A: depth 1756 m, Lat: 34°52.507650'S, Lon: 179°3.515334' E</td>
</tr>
<tr>
<td>02:12</td>
<td>Deploy heat flow probe next to the blanket</td>
<td>Can only get bottom 2 thermistors into sediment (~ 10 cm penetration) J2-1039-1-HF1: depth 1756 m, Lat: 34°52.508052’S, Lon: 179°3.515598’ E</td>
</tr>
<tr>
<td>02:37</td>
<td>Return to elevator and pickup 5 thermal blankets</td>
<td></td>
</tr>
<tr>
<td>03:23</td>
<td>Deploy Thermal Blanket C</td>
<td>J2-1039-2-TB-C: depth 1804 m, Lat: 34°52.360560’S, Lon: 179°3.518322’E</td>
</tr>
<tr>
<td>03:50</td>
<td>Deploy Thermal Blanket B</td>
<td>J2-1039-3-TB-B: depth 1832 m, Lat: 34°52.216020’S, Lon: 179°3.519720'E</td>
</tr>
<tr>
<td>04:17</td>
<td>Deploy Thermal Blanket E</td>
<td>J2-1039-4-TB-E: depth 1845 m, Lat: 34°52.081314’S, Lon: 179°3.521514’E</td>
</tr>
<tr>
<td>04:48</td>
<td>Transit back to elevator to pick up the rest of the blankets</td>
<td></td>
</tr>
<tr>
<td>06:01</td>
<td>At elevator – pick up four blankets</td>
<td></td>
</tr>
<tr>
<td>06:09</td>
<td>Begin transit over to the caldera wall to place the remaining four thermal blankets</td>
<td></td>
</tr>
<tr>
<td>08:03</td>
<td>Deploy Thermal Blanket I</td>
<td>J2-1039-6-TB-I: depth 1575, Lat: 34°51.818586 S, Lon: 179°3.489918 E</td>
</tr>
<tr>
<td>08:40</td>
<td>Transit over to next thermal blanket deployment site</td>
<td></td>
</tr>
<tr>
<td>09:24</td>
<td>Transit over to next thermal blanket deployment site</td>
<td></td>
</tr>
<tr>
<td>10:18</td>
<td>Head over to stockwork zone area</td>
<td></td>
</tr>
<tr>
<td>10:24</td>
<td>Video survey the stockwork zone</td>
<td></td>
</tr>
<tr>
<td>10:40</td>
<td>Sample stockwork outcrop for a rock sample</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Date</td>
<td>Date</td>
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</tr>
<tr>
<td>11:01</td>
<td>Mar 16</td>
<td>Mar 16</td>
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<tr>
<td>11:01</td>
<td>Mar 16</td>
<td>Mar 17</td>
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<tr>
<td>11:10</td>
<td>Mar 16</td>
<td>Mar 17</td>
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<td>11:17</td>
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<td>11:53</td>
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<td>11:59</td>
<td>Mar 16</td>
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<td>12:12</td>
<td>Mar 16</td>
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<td>12:18</td>
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<td>12:37</td>
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<tr>
<td>12:43</td>
<td>Mar 16</td>
<td>Mar 17</td>
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<tr>
<td>13:25</td>
<td>Mar 16</td>
<td>Mar 17</td>
</tr>
<tr>
<td>13:47</td>
<td>02:47</td>
<td></td>
</tr>
<tr>
<td>13:57</td>
<td>Mar 16</td>
<td>Mar 17</td>
</tr>
<tr>
<td>14:04</td>
<td>Mar 16</td>
<td>Mar 17</td>
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<tr>
<td>16:09</td>
<td>Mar 16</td>
<td>Mar 17</td>
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<tr>
<td>16:22</td>
<td>05:22</td>
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<tr>
<td>16:30</td>
<td>05:30</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>CT</td>
<td>Action</td>
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<tr>
<td>-------</td>
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<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>16:42</td>
<td>Mar 16</td>
<td>Get more of the chimney sample at same location J2-1039-14-CH2; in POT 4</td>
</tr>
<tr>
<td>17:05</td>
<td>Mar 16</td>
<td>Start to take an IGT water sample, but temperature not correct (45°C)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check temperature with T-probe: 303°C</td>
</tr>
<tr>
<td>17:30</td>
<td>Mar 16</td>
<td>Reset up to take IGT sample J2-1039-14-IGT 7: depth 1611 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.726441’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.443462’E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature say 93°C but probably incorrect and closer to 303°C based on T-probe</td>
</tr>
<tr>
<td>17:40</td>
<td>Mar 16</td>
<td>Set up to take major water sample J2-1039-14-MAJ-GREEN: depth 1611 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.726441’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.443462’E</td>
</tr>
<tr>
<td>17:49</td>
<td>Mar 16</td>
<td>Leave sample site looking to sample a white chimney</td>
</tr>
<tr>
<td>17:53</td>
<td>Mar 16</td>
<td>Sample small white chimney J2-1039-15-CH1: depth 1605 m; in POT 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.724823’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.437560’E</td>
</tr>
<tr>
<td>18:01</td>
<td>Mar 16</td>
<td>Take a temperature at chimney sample location Temperature: 42°C</td>
</tr>
<tr>
<td>18:05</td>
<td>Mar 16</td>
<td>Take a major sample at this same location J2-1039-15-MAJ-RED: depth 1605 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.724675’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.437341’E</td>
</tr>
<tr>
<td>18:14</td>
<td>Mar 16</td>
<td>Finished sampling. Move over to pickup blankets on the caldera floor and take to elevator</td>
</tr>
<tr>
<td>18:59</td>
<td>Mar 16</td>
<td>At blanket – D Lat: 34°51.926377’S Lon: 179°3.480345 E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Setup to take a heat flow probe measurement</td>
</tr>
<tr>
<td>19:05</td>
<td>Mar 16</td>
<td>Heat flow probe measurement J2-1039-16-HF1 : depth 1806 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.925892’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.478930’E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full penetration 10 min measurement, then 20s heat pulse, and 10min measurement</td>
</tr>
<tr>
<td>19:24</td>
<td>Mar 16</td>
<td>Finished heat probe measurement</td>
</tr>
<tr>
<td>19:28</td>
<td>Mar 16</td>
<td>Retrieve thermal blanket D Then travel over to pickup next blanket</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
<td>Location Details</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>19:58</td>
<td>Retrieve thermal blanket E: depth 1850</td>
<td>Lat: 34°52.075870'S&lt;br&gt;Lon: 179°3.503078'E&lt;br&gt;Travel over caldera floor to pickup next blanket</td>
</tr>
<tr>
<td>20:27</td>
<td>Retrieve thermal blanket B: depth 1834 m</td>
<td>Lat: 34°52.213824'S&lt;br&gt;Lon: 179°3.508042'E&lt;br&gt;Move to next thermal blanket</td>
</tr>
<tr>
<td>20:54</td>
<td>Retrieve thermal blanket C: depth 1805 m</td>
<td>Lat: 34°52.353896'S&lt;br&gt;Lon: 179°3.515702'E&lt;br&gt;Move to next thermal blanket</td>
</tr>
<tr>
<td>21:22</td>
<td>At elevator</td>
<td></td>
</tr>
<tr>
<td>21:24</td>
<td>Place blankets in the elevator: depth 1754 m</td>
<td>Blankets D,C,E,B&lt;br&gt;Lat: 34°52.515841'S&lt;br&gt;Lon: 179°3.512074'E</td>
</tr>
<tr>
<td>21:29</td>
<td>Go and find thermal blanket A</td>
<td></td>
</tr>
<tr>
<td>21:30</td>
<td>Retrieve thermal blanket A: depth 1757 m</td>
<td>Lat: 34°52.505390'S&lt;br&gt;Lon: 179°3.512590'E</td>
</tr>
<tr>
<td>21:33</td>
<td>Back at the elevator&lt;br&gt;Put thermal blanket A in the elevator&lt;br&gt;Secure lid to box</td>
<td></td>
</tr>
<tr>
<td>21:48</td>
<td>Swap out fired major water samplers with empty ones on the elevator</td>
<td>Move White &amp; Yellow from the basket to elevator&lt;br&gt;Move Blue &amp; Orange from elevator to starboard basket</td>
</tr>
<tr>
<td>21:58</td>
<td>Finished moving major samplers on elevator. Prepare to transit back to caldera wall. Estimate 1 hr 12 min</td>
<td></td>
</tr>
<tr>
<td>23:14</td>
<td>At base of cliff / massive outcrop</td>
<td></td>
</tr>
<tr>
<td>00:04</td>
<td>Arrive at a stockwork zone (stockwork zone 3) - white altered rock that is heavily veined with dark brown veins several cms thick. Top of outcrop has dead sulfide chimneys&lt;br&gt;Do video imaging here first and then take a sample</td>
<td></td>
</tr>
<tr>
<td>00:15</td>
<td>Take a sample of the vein material&lt;br&gt;J2-1039-17-R1: depth 1699 m</td>
<td>Lat: 34°51.808015’S&lt;br&gt;Lon: 179°3.485389’E&lt;br&gt;Place sample in right hand blue basket</td>
</tr>
<tr>
<td>00:20</td>
<td>Begin a slow ascent of the outcrop for video</td>
<td></td>
</tr>
<tr>
<td>00:35</td>
<td>Massive blocky lava to the left</td>
<td></td>
</tr>
<tr>
<td>00:38</td>
<td>Continue traverse onto stockwork 2 area</td>
<td></td>
</tr>
<tr>
<td>00:44</td>
<td>Veined altered outcrop</td>
<td></td>
</tr>
<tr>
<td>00:58</td>
<td>Diffuse flow on a small field of small 25 cm high chimneys&lt;br&gt;Depth: 1657 m</td>
<td>Lat: 34°51.759487’S&lt;br&gt;Lon: 179°3.476755'E</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>01:19 Mar 17</td>
<td>Stop at a solitary black smoker chimney</td>
<td>Will get rock sample and IGT here</td>
</tr>
<tr>
<td>01:24 Mar 17</td>
<td>Take sulfide chimney sample</td>
<td>J2-1039-18-CH1: depth 1617 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.720484’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.458347’E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sample in POT 5</td>
</tr>
<tr>
<td>01:35 Mar 17</td>
<td>Set up for IGT water sample</td>
<td>J2-1039-18-IGT8: depth 1617 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.720538’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.458717’E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature 301°C</td>
</tr>
<tr>
<td>01:43 Mar 17</td>
<td>Want to take major water sample but need to move to get starboard swing</td>
<td>arm out</td>
</tr>
<tr>
<td>01:59 Mar 17</td>
<td>Reset position after getting major water bottle out of swing arm</td>
<td>Take major water sample</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J2-1039-18-MAJ-BLUE: depth 1617</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lat: 34°51.721531’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.457583’E</td>
</tr>
<tr>
<td>02:20</td>
<td>Try and take a sample of the remaining stump of the chimney</td>
<td>Broke sample and picked up small wall piece of sample and put in IGT1 basket</td>
</tr>
<tr>
<td>02:32 Mar 17</td>
<td>Have to go and get thermal blankets. Weather is going to worsen here in</td>
<td>the next few hours.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head over to nearest blanket ‘G’</td>
</tr>
<tr>
<td>02:34</td>
<td>Retrieve blanket G: depth 1613 m</td>
<td>Lat: 34°51.711668’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.463627’E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head over to next blanket location</td>
</tr>
<tr>
<td>02:55</td>
<td>Retrieve blanket I: depth 1573 m</td>
<td>Lat: 34°51.777262’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.441636’E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head over to next blanket location</td>
</tr>
<tr>
<td>03:01</td>
<td>Retrieve blanket F: depth 1569 m</td>
<td>Lat: 34°51.756756’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.397812’E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head over to next blanket location</td>
</tr>
<tr>
<td>03:15</td>
<td>Retrieve blanket H: depth 1612 m</td>
<td>Lat: 34°51.806437’S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lon: 179°3.328318’E</td>
</tr>
<tr>
<td>03:20 Mar 17</td>
<td>Need to move to the elevator with the blankets</td>
<td>Will move up in the water column and get towed over by Medea and the wire.</td>
</tr>
<tr>
<td>04:28 Mar 17</td>
<td>Arrive at the elevator</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Time</td>
<td>Event Description</td>
</tr>
<tr>
<td>----------</td>
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<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 04:33    | 17:33    | Place the four blankets in the elevator: depth 1754 m  
          | Lat: 34°52.515532’S  
          | Lon: 179°3.513748'E |  
| 04:42    | 17:42    | Release elevator by pulling pin: depth 1754 m |  
| 04:44    | 17:44    | *Jason* on way up because of worsening weather outlook for tonight and Sunday |  
| 06:09    | 19:09    | *Jason* on deck  
          | **END JASON DIVE 1039** |  
| 06:35    | 19:35    | Elevator reached surface sometime around 6:30 UTC  
          | Ship had it in their sights but now have lost track of it. |  
| 08:05    | 21:05    | In search mode for elevator!  
          | The wind has kicked up dramatically with sustained 25-30 kts and gusts to 35 kts |  
| 09:41    | 22:41    | Current status is no contact visual or otherwise with elevator.  
          | Elevator has all nine of the thermal blankets, 2 major water samplers, a MAPR and *Jason* beacons. |  
| 11:00    | 00:00    | Search overnight and through the day for elevator with no luck. Storm is up 35 kts winds and heavy seas 10-12 ft. |  
| 06:30    | 19:30    | End search for elevator and steam back to start point for a geophysical survey. |  
| 06:33    | 19:33    | Sea surface magnetometer, multibeam EM302 survey along with gravity (GNS system)  
          |  
|          |          | 1, 178, 45.805, -34, -36.002 Start |  
|          |          | 2, 178, 36.538, -34, -28.323 |  
|          |          | 3, 178, 26.344, -34, -34.546 |  
|          |          | 4, 179, 23.008, -35, -06.916 |  
|          |          | 5, 178, 53.948, -35, -43.787 |  
|          |          | 6, 178, 53.815, -35, -48.222 |  
|          |          | 7, 179, 26.119, -35, -07.512 |  
|          |          | 8, 179, 04.605, -34, -50.698 End |  
| 07:05    | 20:05    | Will turn the ship where we are and line up on line to start surveying |  
| 07:38    | 20:38    | Deploy magnetometer (100 m tow cable)  
          | Start geophysical survey; 6 kts transit speed (USBL pole is down for now)  
          | EM302 start logging  
          | Heading to WP 2 |
At WP 3 turning to head to WP 4

Continue with survey

On last line of survey

Will set up for CTD Tow-yo

Finished geophysics survey
Recover magnetometer on board

Begin CTD tow-yo
Launch CTD Cast-1: T18A-01
Tow is from north to south, wind is from the east at 20 kts
Lower CTD to 1900 m then start ship along track
179°2.8920' E  -34°50.1960' S  start
179°4.5540' E  -34°54.0300' S  end

Start ship heading down the line at 1 kt
Wire out 1064 m

Deploy magnetometer for a 36 hr geophysics survey

<table>
<thead>
<tr>
<th>Waypoint</th>
<th>Long (deg min)</th>
<th>Lat (deg min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>179 4.402</td>
<td>-34 -51.368</td>
</tr>
<tr>
<td>2</td>
<td>179 11.496</td>
<td>-34 -31.111</td>
</tr>
<tr>
<td>3</td>
<td>179 14.829</td>
<td>-34 -22.308</td>
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<tr>
<td>4</td>
<td>178 59.444</td>
<td>-34 -5.214</td>
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<tr>
<td>5</td>
<td>178 56.966</td>
<td>-34 -2.906</td>
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<tr>
<td>6</td>
<td>178 52.949</td>
<td>-34 -0.342</td>
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<tr>
<td>7</td>
<td>178 54.573</td>
<td>-33 -54.957</td>
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<tr>
<td>8</td>
<td>179 0.726</td>
<td>-33 -58.889</td>
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<tr>
<td>9</td>
<td>179 5.256</td>
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<tr>
<td>10</td>
<td>179 8.248</td>
<td>-34 -2.479</td>
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<tr>
<td>11</td>
<td>179 8.333</td>
<td>-33 -47.949</td>
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<tr>
<td>12</td>
<td>179 3.632</td>
<td>-33 -39.658</td>
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<td>13</td>
<td>179 9.188</td>
<td>-33 -35.299</td>
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<td>14</td>
<td>179 13.974</td>
<td>-33 -37.179</td>
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<tr>
<td>15</td>
<td>179 17.393</td>
<td>-33 -39.573</td>
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<tr>
<td>16</td>
<td>179 20.983</td>
<td>-33 -42.137</td>
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<tr>
<td>17</td>
<td>179 27.393</td>
<td>-33 -44.957</td>
</tr>
<tr>
<td>18</td>
<td>179 33.803</td>
<td>-33 -42.735</td>
</tr>
<tr>
<td>19</td>
<td>179 38.590</td>
<td>-33 -41.709</td>
</tr>
<tr>
<td>20</td>
<td>179 30.214</td>
<td>-33 -40.940</td>
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<tr>
<td>21</td>
<td>179 28.077</td>
<td>-33 -38.803</td>
</tr>
<tr>
<td>22</td>
<td>179 34.060</td>
<td>-33 -39.145</td>
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<tr>
<td>23</td>
<td>179 39.957</td>
<td>-33 -39.915</td>
</tr>
<tr>
<td>24</td>
<td>179 41.239</td>
<td>-33 -36.239</td>
</tr>
</tbody>
</table>
Continuing with geophysical survey. Slowed the ship to 6 kts for better data and to arrive back at Brothers by 5:00 am local.

On our way to waypoint 27.

Finished geophysics survey – recover magnetometer.

Ship hoves to at Brothers dive site. We will change the oil in the generator.

Put the USBL pole down in preparation for diving.

Sunrise – weather has relented and a dive seems possible. Start preparation for diving with Jason.

Jason in the water. Begin Jason Dive 1040.

Stop at 938 m for Maggie calibration spin.

Finished Maggie calibration spin, resume descent to bottom.

Bottom in sight, fixing issues with level wind n winch.

Jason on bottom.

Do heat flow probe measurement. J2-1040-1-HF1, depth 1829 m.
Lat: 34°52.219458 S
Lon: 179°3.498840 E
600 sec wait period 20 sec heat pulse 20W heat level and 600 sec measurement wait.

End of heat flow measurement. Move on to next station.

Do heat flow probe measurement – half-way in J2-1040-2-HF1: depth 1559 m.
Lat: 34°52.692624’S
Lon: 179°3.727890’E
Do 480 sec wait period (8 mins), then heat pulse, then 8 min measurement.

End of heat flow measurement. Move on to next station.

Do heat flow probe measurement – half-way in J2-1040-3-HF1: depth 1414 m.
Lat: 34°52.695270’S
Lon: 179°3.799314’E
Do 480 sec wait period (8 mins), then heat pulse, then 8 min measurement.

End of heat flow measurement. Move on to next station.
<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01:06</td>
<td>Just starting to cross from talus and volcanic sediments into more silica oxyhydroxide deposits on the seafloor.</td>
</tr>
<tr>
<td>01:27</td>
<td>Stop for heat flow probe measurement – all the way in J2-1040-4-HF1: depth 1309 m Lat: 34°52.766826’S Lon: 179°3.957282’ E Do 480 sec wait period (8 mins), then heat pulse, then 8 min measurement</td>
</tr>
<tr>
<td>01:43</td>
<td>Finished heat flow probe measurement. Prepare to take a sample from this location. Try to get small silica-iron oxyhydroxide chimney piece.</td>
</tr>
<tr>
<td>01:49</td>
<td>Small chimney sample of silica-iron oxyhydroxide deposit J2-1040-4-CH1: depth 1309 Lat: 34°52.766826’S Lon: 179°3.957282’E Placed in POT 7</td>
</tr>
<tr>
<td>01:54</td>
<td>Move to next heat flow probe site</td>
</tr>
<tr>
<td>02:10</td>
<td>Crossed into sulfur-rich area: depth 1222 m</td>
</tr>
<tr>
<td>02:13</td>
<td>Reached the crest of the volcano: 1194 m</td>
</tr>
<tr>
<td>02:17</td>
<td>Stop for heat flow probe measurement – all the way in J2-1040-5-HF1: depth 1197 m Lat: 34°52.774950’S Lon: 179°4.076100’E Do 480 sec wait period (8 mins) then heat pulse then 8 min measurement</td>
</tr>
<tr>
<td>02:34</td>
<td>Finished heat flow measurement. Head to find old thermal blanket that was deployed in 2017. Head down into crater of the volcano.</td>
</tr>
<tr>
<td>02:41</td>
<td>Sulfur chimneys</td>
</tr>
<tr>
<td>02:54</td>
<td>Find thermal blanket in the pit crater</td>
</tr>
<tr>
<td>02:56</td>
<td>Make a heat flow probe measurement near the thermal blanket – probe all the way in J2-1040-6-HF1: depth 1227 m Lat: 34°52.771512’S Lon: 179°4.121664’E Do 480 sec wait period (8 mins), then heat pulse, then 8 min measurement</td>
</tr>
<tr>
<td>03:14</td>
<td>End of heat flow measurement, move off to find a sample of the sulfur chimneys</td>
</tr>
<tr>
<td>03:37</td>
<td>Stopping at sulfur chimney</td>
</tr>
<tr>
<td>03:42</td>
<td>Sulfur chimney sample – very fragile J2-1040-7-CH1: depth 1212 m Lat: 34°52.774416’S Lon: 179°4.113276’E Put in POT 8</td>
</tr>
<tr>
<td>03:49</td>
<td>Move over to sample bigger chimney</td>
</tr>
<tr>
<td>03:57</td>
<td>Sample another sulfur chimney nearby J2-1040-7-CH2: depth 1208 m Lat: 34°52.776294’S Lon: 179°4.111062’E Placed in blue crate</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
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<td>------------------------------------------------------------------------</td>
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<tr>
<td>04:01</td>
<td>Sulfur chimney. J2-1040-7-CH3: depth 1208 m. Placed in blue crate.</td>
</tr>
<tr>
<td>04:10</td>
<td>Move off to next site.</td>
</tr>
<tr>
<td>04:14</td>
<td>White smokers – set up to check temperatures and get water samples.</td>
</tr>
<tr>
<td>04:27</td>
<td>Max temp 167°C – decide to take an IGT sample.</td>
</tr>
<tr>
<td>04:33</td>
<td>Water sample of white smoker. J2-1040-8-IGT3: depth 1213 m.</td>
</tr>
<tr>
<td>04:36</td>
<td>Finished IGT set up for major water sampler. Try BLUE sampler but have problems with it. Swap out samplers.</td>
</tr>
<tr>
<td>04:49</td>
<td>Get another gas tight water sample. IGT4 is not working properly. Swap out for IGT 5.</td>
</tr>
<tr>
<td>04:56</td>
<td>Finished sampling and check the temperature with T-probe.</td>
</tr>
<tr>
<td>05:25</td>
<td>Move off to next target.</td>
</tr>
<tr>
<td>05:29</td>
<td>At heat flow probe site - only half way in.</td>
</tr>
<tr>
<td>05:37</td>
<td>White smoker area. Stop for water sample. J2-1040-10-MAJ-RED: depth 1214 m.</td>
</tr>
<tr>
<td>07:33</td>
<td>Temperature probe registers 199°C at vent where fluid sample was taken.</td>
</tr>
<tr>
<td>07:59</td>
<td>Rock sample of red/white fragile material J2-1040-10-R1: depth 1214 m.</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
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<tr>
<td>08:03</td>
<td>Move up a bit to sample ledge</td>
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<tr>
<td>08:13</td>
<td>Rock sample of ledge material</td>
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<tr>
<td>09:00</td>
<td>Make a heat flow probe measurement</td>
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<tr>
<td>09:17</td>
<td>Finished heat flow station</td>
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<tr>
<td></td>
<td>Head towards Lower Cone.</td>
</tr>
<tr>
<td>10:01</td>
<td>Tether to Jason caught up on Medea. Decide to end dive and come up.</td>
</tr>
<tr>
<td>11:06</td>
<td>Jason on deck</td>
</tr>
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<tr>
<td>11:48</td>
<td>Will in the meantime do a CTD tow-yo</td>
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<td>Get ready for CTD tow-yo: on station</td>
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<tr>
<td>12:04</td>
<td>CTD going down</td>
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<tr>
<td>16:52</td>
<td>End of CTD tow coming up</td>
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<tr>
<td>17:11</td>
<td>CTD back on deck</td>
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<tr>
<td>19:17</td>
<td><em>Jason</em> in the water</td>
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<tr>
<td>19:26</td>
<td><em>Jason</em> going down</td>
</tr>
<tr>
<td>19:55</td>
<td>Stop at 700 m for Magnetometer calibration spin</td>
</tr>
<tr>
<td>20:12</td>
<td>Finished magnetometer spin</td>
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<tr>
<td>21:14</td>
<td><em>Jason</em> on bottom</td>
</tr>
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<tr>
<td>21:38</td>
<td>Make a heat flow probe measurement</td>
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<tr>
<td>21:54</td>
<td>Finished heat flow station. Retrieve and move off to next heat flow target</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>23:06</td>
<td>Stop for a heat flow probe measurement</td>
</tr>
<tr>
<td></td>
<td>Probe not all the way in – about 10 cm above sediment</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°2.305566’E</td>
</tr>
<tr>
<td>23:22</td>
<td>Finished heat flow station. Move on to next heat flow target</td>
</tr>
<tr>
<td></td>
<td>Stop for a heat flow probe measurement</td>
</tr>
<tr>
<td>00:01</td>
<td>Stop for a heat flow probe measurement</td>
</tr>
<tr>
<td>Mar 23</td>
<td>Lon: 179°2.144064’ E</td>
</tr>
<tr>
<td>00:38</td>
<td>Move into sulfur sand dominated terrain</td>
</tr>
<tr>
<td>Mar 23</td>
<td>Lon: 179°2.144064’ E</td>
</tr>
<tr>
<td>00:45</td>
<td>In crater – at Marker ‘08’: depth 1319 m</td>
</tr>
<tr>
<td>Mar 23</td>
<td>Lon: 179°2.28190’E</td>
</tr>
<tr>
<td>00:48</td>
<td>Stop at a shimmering water, clear water venting at cracks in sulfur crust. Take a temperature probe measurement of shimmering water vent</td>
</tr>
<tr>
<td>00:55</td>
<td>Temperature max 62°C</td>
</tr>
<tr>
<td>01:06</td>
<td>Take a sample of sulfur ledge material</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°54.368904’S</td>
</tr>
<tr>
<td></td>
<td>Put in POT 1</td>
</tr>
<tr>
<td>01:17</td>
<td>Moved back to original shimmering water crack and take IGT water sample</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°54.368790’S</td>
</tr>
<tr>
<td></td>
<td>Max temperature 61°C</td>
</tr>
<tr>
<td>01:20</td>
<td>Finished IGT and now decide to get a major water sample</td>
</tr>
<tr>
<td>01:28</td>
<td>Take a major water sample at same location as IGT</td>
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<tr>
<td></td>
<td>Lat: 34°54.368790’S</td>
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<tr>
<td>01:32</td>
<td>Move off to look for more sample locations. Do a slow video transect to the west. Barnacle city!</td>
</tr>
<tr>
<td>01:55</td>
<td>Find a sediment hollow for a heat flow measurement</td>
</tr>
<tr>
<td>02:13</td>
<td>Heat flow measurement finished</td>
</tr>
<tr>
<td>02:24</td>
<td>Move off to find another water sample location. Move down outside of crater and then run east along a contour just outside the crater rim</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
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<tr>
<td>--------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>02:34</td>
<td>Barnacle forest</td>
</tr>
<tr>
<td>03:01</td>
<td>Stopped at a potential sample location for water.</td>
</tr>
<tr>
<td>03:04</td>
<td>Temperature max 59°C</td>
</tr>
<tr>
<td>03:07</td>
<td>Prepare for an IGT water sample</td>
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<tr>
<td>03:17</td>
<td>Finished IGT water sample.  Now take a major water sample from the same location</td>
</tr>
<tr>
<td>03:31</td>
<td>Major water sample</td>
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<tr>
<td>03:34</td>
<td>Finished major water sample.  Decide to take a rock sample here</td>
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<tr>
<td></td>
<td>Rock sample</td>
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<tr>
<td>03:49</td>
<td>Take another rock sample here</td>
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<tr>
<td>03:55</td>
<td>Move off to next target - a place for low temperature fluids for Lucy’s sample</td>
</tr>
<tr>
<td>04:08</td>
<td>Stopped at potential location</td>
</tr>
<tr>
<td>04:17</td>
<td>Temperature measurement shows 16°C</td>
</tr>
<tr>
<td>04:21</td>
<td>Major water sample for Lucy</td>
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<tr>
<td>04:23</td>
<td>Finished sampling, head off to next heat flow site to the east</td>
</tr>
<tr>
<td>05:38</td>
<td>Stopped at a heat flow site</td>
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<tr>
<td>05:53</td>
<td>Finished heat flow measurement.  Move on to next heat flow site</td>
</tr>
<tr>
<td>06:53</td>
<td>Stopped at a heat flow site</td>
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<td>Time</td>
<td>Action</td>
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<td>------------------------------------------------------------------------</td>
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<tr>
<td>07:09</td>
<td>Heat flow station done. Move on to next target</td>
</tr>
<tr>
<td>07:14</td>
<td>Place IODP Marker 2 at potential alternate drill site SEC – 1A</td>
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<tr>
<td>07:17</td>
<td>Head off north across caldera floor</td>
</tr>
<tr>
<td>08:45</td>
<td>Stopped at a heat flow site</td>
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<tr>
<td>09:01</td>
<td>Heat flow measurement finished. Move on across the caldera floor to the north east wall</td>
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<tr>
<td>09:54</td>
<td>Back on the bottom</td>
</tr>
<tr>
<td>10:13</td>
<td>Stopped at a heat flow site</td>
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<tr>
<td>10:30</td>
<td>Finished heat flow station</td>
</tr>
<tr>
<td>10:34</td>
<td>Take a rock sample near base of scarp</td>
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</tr>
<tr>
<td>10:49</td>
<td>Start transect at 1805 m</td>
</tr>
<tr>
<td>11:11</td>
<td>Take a rock sample</td>
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<tr>
<td>11:49</td>
<td>Take a rock sample</td>
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<tr>
<td>12:24</td>
<td>Take a rock sample</td>
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<tr>
<td>12:37</td>
<td>01:37</td>
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<td>13:08</td>
<td>02:08</td>
</tr>
<tr>
<td>13:26</td>
<td>02:26</td>
</tr>
<tr>
<td>13:39</td>
<td>02:39</td>
</tr>
<tr>
<td>13:52</td>
<td>02:52</td>
</tr>
<tr>
<td>14:10</td>
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<td>14:29</td>
<td>03:29</td>
</tr>
<tr>
<td>15:36</td>
<td>04:36</td>
</tr>
<tr>
<td>15:52</td>
<td>04:52</td>
</tr>
<tr>
<td>16:51</td>
<td>05:51</td>
</tr>
<tr>
<td>17:09</td>
<td>06:09</td>
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<tr>
<td>18:11</td>
<td>07:11</td>
</tr>
<tr>
<td>18:27</td>
<td>07:27</td>
</tr>
<tr>
<td>Time</td>
<td>Stop for heat flow probe measurement.</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>18:55</td>
<td>Probe 85% inserted</td>
</tr>
<tr>
<td></td>
<td>J2-1041-23-HF1: depth 1569 m</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°53.771766’S</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°1.909992’E</td>
</tr>
<tr>
<td>19:12</td>
<td>Finished heat flow measurement. Transit to new site</td>
</tr>
<tr>
<td>19:43</td>
<td>Probe 75% inserted</td>
</tr>
<tr>
<td></td>
<td>J2-1041-24-HF1: depth 1569 m</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°53.819520’S</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°1.862682’E</td>
</tr>
<tr>
<td>19:59</td>
<td>Finished heat flow measurement. Move to next site</td>
</tr>
<tr>
<td>20:59</td>
<td>Probe 85% inserted</td>
</tr>
<tr>
<td></td>
<td>J2-1041-25-HF1: depth 1573 m</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°53.809608’S</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°1.939782’E</td>
</tr>
<tr>
<td>21:15</td>
<td>Finished heat flow measurement. Move to next site on caldera floor WC-2A drill location</td>
</tr>
<tr>
<td>22:48</td>
<td>Probe fully inserted</td>
</tr>
<tr>
<td></td>
<td>J2-1041-26-HF1: depth 1873 m</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°53.976744’S</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°2.092386’E</td>
</tr>
<tr>
<td>23:04</td>
<td>Finished heat flow measurement. Head back to caldera wall and upslope to next heat flow station</td>
</tr>
<tr>
<td>23:50</td>
<td>Stop for heat flow probe measurement.</td>
</tr>
<tr>
<td></td>
<td>Probe fully inserted</td>
</tr>
<tr>
<td></td>
<td>J2-1041-27-HF1: depth 1750 m</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°53.775750’S</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°2.042040’E</td>
</tr>
<tr>
<td>00:07</td>
<td>Finished heat flow measurement. Move on to take a rock sample and water samples</td>
</tr>
<tr>
<td>00:38</td>
<td>Stop to sample yellow fluffy slime on chimneys</td>
</tr>
<tr>
<td></td>
<td>Sample of yellow fluffy stuff</td>
</tr>
<tr>
<td></td>
<td>J2-1041-28-CH1: depth 1669</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°51.753240’S</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°3.521844’E</td>
</tr>
<tr>
<td></td>
<td>Put in POT-3</td>
</tr>
<tr>
<td></td>
<td>Max temperature measured to be 30°C</td>
</tr>
<tr>
<td>00:57</td>
<td>Move on to find black smoker chimneys to sample fluids</td>
</tr>
<tr>
<td>01:48</td>
<td>Stopped at sulfide chimney complex to sample black smoker fluid</td>
</tr>
<tr>
<td>02:08</td>
<td>Take an IGT water sample</td>
</tr>
<tr>
<td></td>
<td>J2-1041-29-IGT 1: depth 1638</td>
</tr>
<tr>
<td></td>
<td>Lat: 34°51.717228’S</td>
</tr>
<tr>
<td></td>
<td>Lon: 179°3.523764’E</td>
</tr>
<tr>
<td>Time</td>
<td>Action</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>02:11</td>
<td>Finished IGT sample. Now setup to take a major water sample</td>
</tr>
<tr>
<td>02:37</td>
<td>Take a major water sample at same location as IGT</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>02:46</td>
<td>Move off to look for a small 'snow cone' sample for ALR</td>
</tr>
<tr>
<td>Mar 24</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>03:06</td>
<td>At sample site of bio-sample at white-coated chimney</td>
</tr>
<tr>
<td>Mar 24</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>04:00</td>
<td>Stop to try a slurp sample</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>04:16</td>
<td>Move off to get the last IGT at a black smoker</td>
</tr>
<tr>
<td>04:32</td>
<td>At a tall skinny black smoker chimney.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>04:46</td>
<td>Pickup small skinny chimney sample and put in blue sample crate right</td>
</tr>
<tr>
<td>Mar 24</td>
<td>hand side</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>05:19</td>
<td>Stop for heat flow probe measurement.</td>
</tr>
<tr>
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<td></td>
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<tr>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>05:37</td>
<td>Finished heat flow measurement. Move to next HF station</td>
</tr>
<tr>
<td>06:19</td>
<td>Stop for heat flow probe measurement.</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>06:36</td>
<td>Finished heat flow measurement.</td>
</tr>
<tr>
<td>06:40</td>
<td>Setup for survey</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>07:31</td>
<td>Now doing multibeam survey with Reson on Jason</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>08:38</td>
<td>Start line 1 - 1500 m long</td>
</tr>
<tr>
<td>10:30</td>
<td>The long range Doppler is acting up. Will need to use short range</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>Resuming line 1</td>
</tr>
<tr>
<td>11:57</td>
<td>End of line 1</td>
</tr>
<tr>
<td>Time</td>
<td>Duration</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>12:18</td>
<td>01:18</td>
</tr>
<tr>
<td>14:00</td>
<td>03:00</td>
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<tr>
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<td>20:54</td>
<td>07:54</td>
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<td>21:32</td>
<td>08:32</td>
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<tr>
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<td>22:13</td>
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</tr>
<tr>
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<td>Mar 25</td>
</tr>
<tr>
<td>23:30</td>
<td>12:30</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>00:00</td>
<td>13:00</td>
</tr>
<tr>
<td>Mar 25</td>
<td>Mar 25</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>01:16</td>
<td>14:16</td>
</tr>
<tr>
<td>Mar 25</td>
<td>Mar 25</td>
</tr>
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<td>01:21</td>
<td>14:21</td>
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<td>Mar 25</td>
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<td>11:01</td>
<td>00:01</td>
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<tr>
<td>Mar 25</td>
<td>Mar 26</td>
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<td>21:30</td>
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<td>Mar 25</td>
<td>Mar 26</td>
</tr>
<tr>
<td>Lowering number</td>
<td>Station number</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>J2-1038</td>
<td>3</td>
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<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>896</td>
<td>No</td>
</tr>
</tbody>
</table>

Lat: -34.85891252  
Long: 179.05009592  
Hdg: 15.28  
Depth: 1300.72  
Alt: 4.29m

**Description:** Flange sample, hollow interior, event 906 has picture of hollow area left behind, pot 6, red/black, manganese crust, orange biofilm, slimy inside, soft fragile, ground up thin wall structure.

From Cornel: Tapered sample, 14 cm long by 6 cm wide of very light weight, orange-tan-colored silica-rich Fe-oxide ‘chimney’. Two-thirds of sample of sample sits with A-L R. Represents low-temperature diffuse venting, as given by measure temperature of 42°C. Interior has a ‘flaky’ appearance, reminiscent of pages in a book.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>4</td>
<td>J2-1038-4-R2</td>
<td>1-4 = DNA extract</td>
<td>55C</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5-9 = Cryovials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10-13 = Serum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>952</td>
<td>No</td>
</tr>
</tbody>
</table>

Lat: -34.85888722  
Long: 179.05030464  
Hdg: 264.42  
Depth: 1302.16m  
Alt: 1.81m  

**Description:** Flange sample, hollow interior, event 965, flange, ground whole structure, slimy interior, in Pot 5 white/black
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>5</td>
<td>J2-1038-5-R3</td>
<td>63-66 = DNA extract 67-72 = cryovials 73 = serum tube</td>
<td>279C, 272C</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
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<tbody>
<tr>
<td>1110</td>
<td>J2-1038-6-IGT3</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-IGT4</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-MAJ-White</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-TC-Red/White</td>
</tr>
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<td></td>
<td>Lat: -34.85791961</td>
</tr>
<tr>
<td></td>
<td>Long: 179.05193327</td>
</tr>
<tr>
<td></td>
<td>Hdg: 70.95</td>
</tr>
<tr>
<td></td>
<td>Depth: 1319.25m</td>
</tr>
<tr>
<td></td>
<td>Alt: 6.50m</td>
</tr>
</tbody>
</table>

**Description:** sulfide chimney piece from black smoker, chimlet, same station as J2-1038-6-R4, outer approx.. 2mm crust, hard mineralized interior, smaller sample, pot 7 red.

From Cornell: Sample was actively venting hydrothermal fluids up to 279°C (see pic below). Larger piece (with A-L R) 16 cm long showing whole chimney and a partially broken conduit, with a smaller, similar piece 8 cm long with 3 cm orifice. Wall is only 3 mm thick and dominated by more coarse chalcopyrite with finer-grained sphalerite ± barite mantle, with very thin Fe-oxide outer coating. Once again, we see the high-temperature, higher flux Cu-rich chimneys have a flattened or oblate morphology, rather than round like the larger chimneys do.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>6</td>
<td>J2-1038-6-R4</td>
<td>31-34 = DNA extract 35-40 = cryovials 41-46 = serum tubes</td>
<td>279C, 272C</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1126</td>
<td>J2-1038-6-IGT3</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-IGT4</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-MAJ-White</td>
</tr>
<tr>
<td></td>
<td>J2-1038-6-TC-Red/White</td>
</tr>
</tbody>
</table>

**Description:** Large structure, beehive on top, collected base, same station as J2-1038-5-R3, outer approx.. 3mm crust homogenized for sample, pot 8 green white.

From Cornell: One piece 21 cm long by 8 cm in diameter part of chimney adjacent to more active ones expelling 279°C fluids (see pic below). Once sampled, hydrothermal fluid did flow from this chimney, which has a 2 x 1 cm orifice at its top, lined by a 1 mm thick wall of chalcopyrite; otherwise is dominated by pyrite-sphalerite + barite. Very exterior has 1 mm rind of Fe-oxides.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>12</td>
<td>J2-1038-12-R5</td>
<td>47-50 = DNA extract 51-56 = cryovials 57-62 = serum tube</td>
<td>243C</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2172</td>
<td>J2-1038-12-IGT6</td>
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<tr>
<td></td>
<td>Lat: -34.86105499</td>
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<tr>
<td></td>
<td>Long: 179.05742923</td>
</tr>
<tr>
<td></td>
<td>Hdg: 261.54</td>
</tr>
<tr>
<td></td>
<td>Depth: 1581.87m</td>
</tr>
<tr>
<td></td>
<td>Alt: 8.56</td>
</tr>
</tbody>
</table>

**Description:** Beehive structure, failed attempt at main structure, used scoop to grab fragments, some walls looked to have white biofilm, outer wall, mushy on inside, homogenized mostly outer wall for sample. Pot 4 green

From Cornell: Sample taken using a scoop to collect beehive part of the active chimney that was venting 243°C at time of venting. Very friable. Dominated by fine-grained pyrite and probable sphalerite with noticeable laths of barite. Exterior has classical rib-like features common to beehive chimneys.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>12</td>
<td>J2-1038-12-R6</td>
<td></td>
<td></td>
<td>No</td>
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</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2327</td>
<td>Adjacent to J2-12-IGT-6</td>
</tr>
</tbody>
</table>

**Description:** Extinct sulfide structure, adjacent to J2-1038-12-R5
From Cornell: Single piece of dense, dead chimney 18 cm long by 12 cm wide. Is oblate in cross section and has a fluted exterior. It was extinct at time of sampling and sat next to some active venting (IGT-6). It is obviously older insomuch as the chimney interior is almost completely infilled by Mn-oxides that will have precipitated in the orifice as the flow ceased and then stopped altogether. The core, or interior of the chimney is lined by a 10-12 mm thick zone of chalcopyrite ± pyrite, surrounded by a thicker (1-2 cm) zone of sphalerite + pyrite + barite, typical of the Cu-rich chimneys seen at Brothers. The exterior of the chimney is colored red-brown, representing oxidation (seafloor weathering) of the sulfides that alter to Fe-oxides. Fossilized worm casts seen on the exterior of the chimney.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>13</td>
<td>J2-1038-13-R7</td>
<td>74-77 = DNA extract</td>
<td>303C</td>
<td>No</td>
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<tr>
<td></td>
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<td></td>
<td>78-83 = cryovials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>84-85 = serum tubes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2512</td>
<td>J2-1038-13-IGT5</td>
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<tr>
<td></td>
<td>J2-1038-13-MAJ-Yellow</td>
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<td>J2-1038-13-TC-Red/Black</td>
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<td>Depth: 1582.50</td>
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<tr>
<td></td>
<td>Alt: 1.76</td>
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</tbody>
</table>

**Description:** Small chimlet, labeled as 12-R7 in van sample sheet, correct in virtual van, hard walled, thick walls, iron oxide outer crust, sampled outer crust, Pot 2 white. From Cornell: Two larger (12 cm long) and few small pieces of Cu-rich chimney wall. Conduit lined by coarse chalcopyrite (2-5 mm), mantled by grey sphalerite ± barite-rich zone (≤1 cm) with 1-2 mm wide exterior of Fe-oxides. Same chimney as J2-1038-13-R8 (cf. description).
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>13</td>
<td>J2-1038-13-R8</td>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
</table>
| 2590    | Lat: -34.86150617  
Long: 179.05730381  
Hdg: 330.00  
Depth: 1582.51m  
Alt: 1.71m |

Description: Sulfide chimney from bottom of J2-1038-13-R7, labeled as R7 in virtual van, picked up from ground,
From Cornell: Active black smoker chimney. One larger piece 22 cm long that has the chimney interior exposed, and two other narrower pieces 22 and 24 cm long, respectively that are complete segments of what was initially a larger chimney (see pics and videos during sampling). I suspect the two narrower segments were joined. At least ten smaller pieces <9 cm in length, each a part of the chimney wall. The largest piece shows minimum 1 cm thick walls with a much larger (up to 6 cm) diameter orifice. Interior wall lined by dark grey, fine-grained pyrite + sulfate that looks largely to be barite, but may have some intergrown anhydrite? This is followed by a ~ 5 mm thick zone of massive brass-colored chalcopyrite that is in turn mantled by a ≥8 mm thick zone of grey, dominantly sphalerite ± barite. Finally, a zone mm to cm thick of fine-grained pyrite with more barite, whose outer-most surface is oxidized red to Fe-oxides. Individual barite crystals can be seen radiating inwards from the exterior of the chimney walls towards the chalcopyrite center. One of the two narrower pieces has its interior almost entirely infilled by massive chalcopyrite, whereas the other has 1-2 mm thick walls lined by fine-grained chalcopyrite + pyrite ± barite. No signs of animals on the chimney exterior.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>15</td>
<td>J2-1038-15-CH1</td>
<td>105=Serum tube</td>
<td>240C</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>3377</td>
<td>J2-1038-15-MAJ-Red</td>
</tr>
</tbody>
</table>

Description: Large chimney structure, attempted to place in chamber pot, ended up in Hobo box, smaller piece is J2-1038-15-CH2, Serum tube filled from white precipitate on chimney after sitting on bench overnight for culturing.

From Cornell: Sample dominated by larger piece of intact chimney ~38 cm long and up to 18 cm wide. Is a delicate structure, as noted in the attached picture and seen on video. It is an intricate array of sinewy chimneys of various diameter. Hydrothermal fluid was seen to be expelled from multiple orifices, with one exposed on this sample showing relatively coarse-grained, mm-thick chalcopyrite lining the interior of the chimney, surrounded by a thicker (cm +) zone of grey, fine-grained sphalerite with coarser barite crystals. The 5 or 6 pieces that accompany the larger one are typically <15 cm in length and each represents a separate, smaller chimney. These are typically thin-walled (<5 mm) and lined by chalcopyrite. Common to these chimneys, and seen elsewhere, is the fact that the orifice is not circular in shape, but rather is flattened, or oblate. This is only really seen in high-temperature Cu-rich chimneys with high fluid flux (i.e., not in Zn-rich chimneys where the orifice is convoluted and flux is lower). Exterior of chimney composed of fine-grained pyrite + barite. No evidence for animals on the chimney exterior. All told, very similar type of chimney to J2-1038-13-R8.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1038</td>
<td>15</td>
<td>J2-1038-15-CH2</td>
<td>86-93 = DNA extraction&lt;br&gt;94-99 = cryovials&lt;br&gt;100 = serum tube</td>
<td>240C</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>3381</td>
<td>J2-1038-15-MAJ-Red&lt;br&gt;Lat: -34.85781167&lt;br&gt;Long: 179.05212092&lt;br&gt;Hdg: 195.23&lt;br&gt;Depth: 1330.93m&lt;br&gt;Alt: 2.96m</td>
</tr>
</tbody>
</table>

**Description:** Smaller piece of J2-1038-15-CH1, thin walled, whole sample homogenized for sample, pot 1 orange. From Cornell: Same chimney complex as J2-1038-15-CH1 (cf. description). Here, a much smaller piece of chimney spire 7 cm long with a 1 cm diameter orifice. Wall is 1-2 mm thick and dominated by chalcopyrite.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1039</td>
<td>10</td>
<td>J2-1039-10-R1</td>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>5313</td>
<td>No</td>
</tr>
</tbody>
</table>

Lat: -34.86101402  
Long: 179.05767946  
Hdg: 280.51  
Depth: 1594.06m  
Alt: 3.79m

**Description:** Stockwork vein, port blue bin,  
From Cornell: Sampled what was a large outcrop of the brown vein-like material that appears to have grown out of the actual red-brown veins that make up the stock work zone in this area. When sampling, loads of green colored ‘dust’ cascaded down the rock face; almost certainly related to Cu mineralization. Sampling proved to be difficult for the ROV but eventually we prized off a piece. Upon inspection, sample looks more like massive sulfide chimney material, than the flat, planar vein sampled in J2-1039-17-R1. Could fluids have been expelled from one of these veins and produced this massive sulfide, like those sitting chimneys on top of the sequence? Sample is comprised of 4 pieces, the largest 12 cm long by 8 cm wide. The interior is porous with chalcopyrite lining the very center of the sample, mantled by dark grey, probably sphalerite + pyrite + barite. Outermost rind is ~ 1mm thick zone of Mn and Fe-oxide. See worm casts on exterior of sample and odd, nob-like features on the surface of the massive sulfide.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1039</td>
<td>11</td>
<td>J2-1039-11-CH1</td>
<td>151-154 = DNA extract</td>
<td>318C</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>155-156 = cryovial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
</table>
| 5430    | J2-1039-11-IGT1  
|         | J2-1039-11-IGT2  
|         | J2-1039-11-MAJ-White |
|         | Lat: -34.86111866  
|         | Long: 179.05766514  
|         | Hdg: 337.44  
|         | Depth: 1599.49m  
|         | Alt: 4.03m |

**Description:** Chimney piece from back smoker on wall, in pot #6 (red/black), small sample, only DNA, outer 1-2mm scraped.  
From Cornell: Three small (<3 cm long) pieces of Cu-rich, active black smoker chimney. Highest temperature recorded to date for vent fluids. Medium-coarse-grained 2 mm zone of chalcopyrite lines the chimney orifice, mantled by 1 cm thick grey, sphalerite + pyrite + barite zone.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
</table>
| J2-1039        | 12            | J2-1039-12-CH1 | 122-125 = DNA extract  
126-131 = cyrovial  
132-135 = serum tube | No |

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>5570</td>
<td>No</td>
</tr>
</tbody>
</table>

**Description:** Chimney sample, in pot# 7 (red), really hard exterior, 3-4 mm outer crust, white crust.  From Cornell: Small, active chimney sampled on massive sulfide-rich sediment and talus. Several pieces, each < 5 cm long. Most have coarse-textured pyrite-sphalerite + barite; one has very coarse chalcopyrite with nice crystals of the latter seen growing into the orifice. Exterior texture is more fine-grained and beehive-like. Exterior surface has bulbous texture in places.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1039</td>
<td>12</td>
<td>J2-1039-12-CH2</td>
<td>106-109 = DNA extract</td>
<td></td>
<td>153C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>110-115 = cryovials</td>
<td></td>
<td>No</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>116-120 = serum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>5665</td>
<td>No</td>
</tr>
</tbody>
</table>

**Description:** Chimney top, black and white structure, in pot# 2 (white), sampled most of outer white crust, hard exterior, 3-4mm crust
From Cornell: Sampled short, beehive-like chimney and ended up with 4 pieces, the largest of which is 9 cm across. All pieces are similar, with coarse chalcopyrite + pyrite in the interior with more sphalerite + barite near the exterior chimney wall. Finer-grained outer wall. Clots of barite locally.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1039</td>
<td>13</td>
<td>J2-1039-13-CH1</td>
<td>136-139 = DNA extract</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>140-145 = cryovials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>148-150 = serum tubes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
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<th>Long: 179.05770296</th>
<th>Hdg: 208.90</th>
<th>Depth: 1596.49m</th>
<th>Alt: 3.96m</th>
</tr>
</thead>
<tbody>
<tr>
<td>5783</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description:** Chimney in pot #8 (green/white), tube worm casings removed, scraped outer chimney crust
From Cornell: Three pieces of active chimney, the largest 10 cm in length. Inside of chimney is moderately grained chalcopyrite + pyrite with 1-1.5 cm zone outwards from the chalcopyrite of grey sphalerite + barite that locally has what looks like black Mn oxide near the chimney exterior. The outside surface of the large chimney piece appears ‘ribbed’ and marked by worm casts. Mottled surface on the exterior, locally.
### Table

<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1039</td>
<td>14</td>
<td>J2-1039-14-CH1</td>
<td>198-201 = DNA extract 202-207 = cryovials 208-209 = serum tube</td>
<td>183</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>6211</td>
<td>J2-1039-14-MAJ-Yellow</td>
</tr>
</tbody>
</table>

### Description

Low temp. chimney in pot #1 (orange), 1-2mm white crust outer scrape for molecular samples, sterile seawater added for culturing tubes.

From Cornell: Single, conical shaped chimney sample 18 cm high and up to 14 cm wide with a 1-2 cm orifice that is mostly infilled by mineralization, which represents probably half of the chimney that was sampled (see pics). Relatively coarse crystals of chalcopyrite are seen near the chimney center otherwise dominated by finer-grained pyrite in a zone up to 8 cm wide, surrounded by light grey/white zone dominated by (locally laminated) barite followed by a narrow (4-5 mm) wide dark brown zone of Fe-oxides + Mn(?) then 1-2 mm wide zone that marks the chimney exterior that is oxidized. The outside surface of the chimney has whitish colored patches that locally has worm casts on it and some vertical chimney growth(?) lines (note, is also scarred by sampling for microbes). Sample is relatively heavy.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
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<tbody>
<tr>
<td>J2-1039</td>
<td>14</td>
<td>J2-1039-14-CH2</td>
<td>172-175 = DNA extract</td>
<td>303</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>176-181 = cryovials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>182-185 = serum tube</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>6298</td>
<td>J2-1039-14-IGT7</td>
</tr>
<tr>
<td></td>
<td>J2-1039-14-MAJ-Green</td>
</tr>
<tr>
<td></td>
<td>Lat: -34.86208959</td>
</tr>
<tr>
<td></td>
<td>Long: 179.05738805</td>
</tr>
<tr>
<td></td>
<td>Hdg: 284.42</td>
</tr>
<tr>
<td></td>
<td>Depth: 1611.18m</td>
</tr>
<tr>
<td></td>
<td>Alt: 2.80m</td>
</tr>
</tbody>
</table>

**Description:** Orange chimney structure, large, could not close pot in pot #4 (green), well defined conduit, scraped iron oxide crust from entire chimney for sample.

From Cornell: Whole chimney 27 cm long and 12 cm at widest diameter. Typical of most of the active, high temperature chimneys sampled at the NW Caldera site, i.e, lined by 1cm wide band of chalcopyrite with wider, up to 3 cm zone of grey sphalerite + pyrite + barite. Possibly see at least two cycles of this zonation. Inside the orifice, see striped, alternating grey and white bands, probably dominated by more pyrite and more sulfate, respectively. See clots of barite in the chimney walls and exterior is oxidized red-brown Fe-oxides.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
</table>
| J2-1039         | 15             | J2-1039-15-CH1  | 157-160 = DNA extract  
                    |                | 161-166 = cryovials  
                    |                     | 167-171 = serum      | 42C       | No        |

| Event #   | Chemistry   | Lat: -34.86207984  
                    | Long: 179.05728924  
                    | Hdg: 282.80         
                    | Depth: 1604.62m     
                    | Alt: 2.96m          |
|-----------|--------------|-------------------|---------------------|------------------------|-----------|
| 6474      | J2-1039-15-MAJ-Red |                   |                     |                        |           |

**Description:** White chimney in pot #3 (red/white), no photograph on ship, few Alvinellid worms on outer surface, removed and scraped 1mm crust, for serum tubes, top of structure added and homogenized with remaining scrape

From Cornell: Three pieces of low-temperature venting chimney. Largest measures 10 x 8 cm. Interior dominated by moderate to coarsely crystalline chalcopyrite + pyrite, surrounded by similarly coarse crystalline sphalerite + barite. Exterior of sample is whitish and more fine-grained. Exterior has a 'fluted' appearance with outer surface locally covered by a mottle like texture (almost like geyserite looks in geothermal sinter springs).
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1039</td>
<td>17</td>
<td>J2-1039-17-R1</td>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
</table>
| 7360    | Lat: -34.86346692  
|         | Long: 179.05808982  
|         | Hdg: 310.22  
|         | Depth: 1698.76m  
|         | Alt: 4.30m |

**Description:** From Cornell: Piece of stock work vein 16 cm long by 7 cm wide and max 2 cm thick. Planar vein that was protruding from pale grey-colored, highly altered wall rock (as part of this sample—see below). Vein appears to be dominated by massive pyrite, though given greenish hues and flecks of a mineral on margin of sample, and in wall rock (see photo), suggest it almost certainly contains copper. Out margin/surface of vein has coarse textured, probably pyrite grains plus laths of barite. Sample appears laminated in places with inclusions of wall rock enclosed within the massive sulfide vein. Exterior of vein is red-brown in color, as seen for all these veins in the stock work area.

Small pieces of white-grey colored wall rock were included in the sample. Rock has been completely hydrothermally altered by high-temperature, acidic fluids. Clots of fine-grained pyrite seen in the sample.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
</table>
| J2-1039        | 18             | J2-1039-18-CH1 | 186-189 = DNA extract  
190-195 = cryovials  
196-197 – serum tube | 301 | No |

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
</table>
| 7540    | J2-1039-18-IGT8  
J2-1039-18-MAJ-Blue | Lat: -34.86200807  
Long: 179.05763912  
Hdg: 318.79  
Depth: 1617.46m  
Alt: 3.04mm |

**Description:** Reddish black smoker chimney, Pot #5 (white/black), soft outer 2-3mm iron oxide crust, sampling around entire structure, large chimney

From Cornell: Top part of chimney also sampled in J2-1039-18-CH2, which was the basal part. Cu-rich chimney with fine-grained pyrite lining the orifice wall, surrounded by 1 cm thick zone of chalcopyrite with the grey, sphalerite + barite zone closer to the exterior of the sample. Thin, Fe-oxide outer layer marks the exterior of the chimney.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1039</td>
<td>18</td>
<td>J2-1039-18-CH2</td>
<td></td>
<td>301</td>
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<thead>
<tr>
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<th>Lat: -34.86201514</th>
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<th>Hdg: 294.59</th>
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<th>Alt: 2.59mm</th>
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<tbody>
<tr>
<td>7673</td>
<td>J2-1039-18-IGT8</td>
<td>J2-1039-18-MAJ-Blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description:** Same as J2-1039-18-CH1, placed in IGT crate. From Cornell: Sample comprised of 3 pieces; largest is 13 cm long and is half of a chimney, broken length-wise. Wall of chimney is ~ 1 cm thick, with inner-most part lined with very fine-grained probable pyrite ± barite which in turn is mantled by 3 mm thick zone of coarse chalcopyrite, itself mantled by 6 mm thick zone of grey, sphalerite ± pyrite + barite. The outer-most rind is ~ 1 mm thick silica(?) + barite with Fe-oxidized red-colored sulfides. Contact between the chalcopyrite zone and the sphalerite zone is locally ‘fluted’ in a vertical direction.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>4</td>
<td>J2-1041-4-R1</td>
<td>295-308 = cryovials</td>
<td>60-61C</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>310-314 = serum tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>337-338 = 50cc falcon</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Notes:</th>
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<tbody>
<tr>
<td>10531</td>
<td>J2-1041-4-IGT8</td>
<td>Lat: -34.878368</td>
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<tr>
<td></td>
<td>J2-1041-4-MAJ-Red</td>
<td>Long: 179.071443</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth: 1315.44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heading: 317.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alt: 2.44</td>
</tr>
</tbody>
</table>

**Description:** sulfur ledge sample, pot #1 (orange).

Three pieces, each < 3 cm in size. Is a crust (see pic). Sits on top of ash material. A ~1 cm thick zone of fine-grained, white-tan colored material (alunite?) is mantled by relatively coarse crystalline native sulfur. Diffuse venting nearby.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>6</td>
<td>J2-1041-6-R1</td>
<td></td>
<td>59-71C</td>
<td>No</td>
</tr>
</tbody>
</table>

**Event #**  
**Chemistry**  
J2-1041-6-IGT7  
J2-1041-6-MAJ-Green  

**Notes:**  
Lat: -34.878848  
Long: 179.071378  
Depth: 1329.78  
Heading: -

**Description:** Rock box #1, too large for chamber pot.

Single, large (22 x 15 x 2 cm) piece of fine-grained, black, lava. Is coated by both white-tan colored possible alunite mineralization and yellow native sulfur, as seen in J2-1041-4-R1. Has worm casts and limpets on it (removed) and is in an area of diffuse venting with lots of shrimps and crabs. Sulfur etc appears to be matrix to talus.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>6</td>
<td>J2-1041-6-R2</td>
<td>324-329 = cryovials 330-334 = serum tube 335 = 15cc falcon</td>
<td>59-71C</td>
<td>No</td>
</tr>
</tbody>
</table>

### Notes:

**Description:** Pot #2 (white).

Half a dozen small (< 5 cm) pieces that range from relatively fresh, black, glassy lava mantled by a white-tan colored material (alunite?), to breccia with native sulfur matrix, to native sulfur itself. Covered by limpets (removed). Diffuse venting at sampling site.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>11</td>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Event #**

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lat: -34.865096</td>
</tr>
<tr>
<td>Long: 179.072668</td>
</tr>
<tr>
<td>Depth: 1810.92 m</td>
</tr>
<tr>
<td>Heading: -</td>
</tr>
</tbody>
</table>

**Description:** Rock from massive lava flow.

Large (15 x 11 x 13 cm) sample of dark grey, volcanic rock from a massive lava. Quite vesiculated with individual vesicles stretched locally. Largest vesicle is 6 m long, some around 1 cm, with the majority <3 mm. See phenocrysts of feldspars in otherwise fine matrix (porphyritic). See what looks like small (< 1 mm) crystals of quartz = dacite. Cannot easily see mafic phenocrysts.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>12</td>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:**

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Lat: -34.864529</th>
<th>Long: 179.073032</th>
<th>Depth: 1773 m</th>
<th>Heading: 40 °</th>
</tr>
</thead>
<tbody>
<tr>
<td>12070</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description:** Rock from blocky, fractured lava.

Rock sampled from a flow. Dark grey to black colored piece of lava. Stretched (indicative of flow?) vesicles up to 2 cm long; locally lined by Mn ± weathered suggesting has been exposed to weathering for a time. One surface is more glassy suggesting top of flow? See feldspar phenocryst up to 3 mm long. See what appears to be clots of quartz crystals? Dacite.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>13</td>
<td>R1</td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

### Notes:

- Lat: -34.864262
- Long: 179.073503
- Depth: 1700 m
- Heading: 14 °

**Description:** Rock from massive lava.

Single piece of lava 18 x 10 x 8 cm. More weathered than any of the samples collected before this one. Part of a massive lava flow. Similar to the other rocks though, in that is vesiculated, with individual vesicles up to 2 cm in length. See up to 2 mm ‘clots’ of quartz; otherwise phenocrysts of feldspar hard to see.
<table>
<thead>
<tr>
<th>Lowering</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>14</td>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:**

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Lat: -34.863569</th>
</tr>
</thead>
<tbody>
<tr>
<td>12285</td>
<td>No</td>
<td>Long: 179.074166</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth: 1634 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heading: 314 °</td>
</tr>
</tbody>
</table>

**Description:** Rock sample taken from top (?) of layered lava unit.

Single piece of lava 19 x 10 x 5 cm. Reasonably seafloor weathered with Fe-oxidation and Mn coating. Stretched vesicles present; up 1 cm but mostly <3 mm. Porphyritic texture with 1-2 mm feldspar phenocrysts and possibly some quartz clots. Like pretty much all the samples, looks like a dacite. Massive (> 300 vertical m) pile of dacite flows?
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>15</td>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Notes:</th>
</tr>
</thead>
</table>
| 12323     | No        | Lat: -34.863457  
Long: 179.074298  
Depth: 1608 m  
Heading: 26 ° |

**Description:** Very blocky, thick lava flow.

Large sample 13 x 12 x 10 cm of black lava. Exterior is weathered/oxidized. Surfaces show abundant, stretched vesicles up to 1 cm long. Possible small phenocrysts though hard to tell without cutting the sample. Different perhaps to 1041-11-R1.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>16</td>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>12407</td>
<td>No</td>
<td>Lat: -34.862991</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long: 179.074822</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth: 1563 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heading: 58 °</td>
</tr>
</tbody>
</table>

**Description:** Massive lava.

12 x 10 x 8 cm sample of dark lava. Weathered on its exterior. Similar to J2-1041-12-R1 and -15-R1. Almost looks like flow banding? Vesiculated, like all the other samples, with vesicles narrow but up to 1.5 cm long, although typically shorter. See phenocrysts of feldspar up to 2 mm; not so easy to see any quartz crystals?
### Lowering number

<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>17</td>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>12453</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

| Lat: -34.86278 |
| Long: 179.075133 |
| Depth: 1511 m |
| Heading: 39 ° |

**Description:** Blocky lava. Single piece of lava 15 x 10 x 7 cm. Appears fairly fresh. Vesiculated with vesicles up to 1 cm though mostly shorter in length. See feldspar phenocrysts up to 2 mm in length; locally see what appear to be ‘clots’ of quartz crystals.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>18</td>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Event #** | **Chemistry** | **Notes:**

12489 | No | Lat: -34.862558  
Long: 179.075246  
Depth: 1483 m  
Heading: 356 °

**Description:** Very blocky lava, top of the ridge.

Two samples; one 12 cm long, the other 8 cm. Sampled from black, blocky lava flow. The smaller sample is quite glassy on its exterior and contains numerous vesicles < 3 mm long, mostly 1 mm. Appear stretched. Outer surface weathered. Larger piece similar, with stretched vesicles more prevalent. Phenocrysts of feldspar not obvious in either sample.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>28</td>
<td>J2-1041-28-CH1</td>
<td>279-288 = cryovials 289-294 = serum tubes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Notes:</th>
</tr>
</thead>
</table>
| 14043   |           | Lat: -34.862587  
Long: 179.058108  
Depth: 1669.41  
Heading: 268.11  
Alt: 2.81 |

**Description:** Sample in pot #3 (red/white). Unique structure with filaments and bioflocs, microbial mound, iron oxide, two kinds of sample outside filaments for -1, everything else homogenized for -2

No sample left to describe.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>30</td>
<td>J2-1041-30-CH1</td>
<td>315-320 = cryovials</td>
<td>321-323 = serum tubes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>14323</td>
<td></td>
<td>Lat: -34.861904</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long: 179.057875</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth: 1621.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heading: 190.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alt: 0.75</td>
</tr>
</tbody>
</table>

**Description:** small chimney structure with white biofilm, in pot #4 (green).

No sample left to describe.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Site number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1041</td>
<td>31</td>
<td>J2-1041-31-CH1</td>
<td></td>
<td>200C</td>
<td>No</td>
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</table>

**Event #**

<table>
<thead>
<tr>
<th>Chemistry</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>14538</td>
<td>J2-1041-31-IGT2</td>
</tr>
<tr>
<td></td>
<td>Lat: -34.861992</td>
</tr>
<tr>
<td></td>
<td>Long: 179.057744</td>
</tr>
<tr>
<td></td>
<td>Depth: 1622.64</td>
</tr>
<tr>
<td></td>
<td>Heading: -</td>
</tr>
</tbody>
</table>

**Description:** Active high temperature chimney, in starboard blue milk crate.

Base of black chimney pictured in the photograph (15 x 13 cm). Inner-most zone is 7-8 mm thick layer of chalcopyrite surrounded by much thicker (2 cm) zone of grey-white sphalerite + pyrite ± barite ± anhydrite(?). Has an outer zone ~ 4 mm thick of more Fe-oxidized material. ‘Root’ of sample is dominated by the grey-white material which appears to be highly altered host rock (see pic). Seen in the host rock nearby, are yellow-colored, oxidized pieces of massive sulfide. Is this also stockwork here or possibly in part, a mound of massive sulfide? Also have a small piece of very delicate, long (50-60 cm long originally?), spire that was attached to the base shown. Mostly lined by chalcopyrite with a thin zone of Fe-oxidized outer zone.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1040</td>
<td>4</td>
<td>J2-1040-4-CH1</td>
<td>264-267 = DNA extract 268-273 = Cryovials 274-276 = Serum tube</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>8520</td>
<td>No</td>
</tr>
</tbody>
</table>

Lat: -34.88182094  
Long: 179.06558181  
Hdg: 114.01  
Depth: 1308.66m  
Alt: 2.28m

**Description:** sample of oxyhydroxide chimney, pot #7 (red), bright red, iron oxyhydroxide mound, red areas are soft, mushy, 'wall' harder, homogenized together for sample.  
From Cornell: Two small (~2 cm long) pieces of small Fe-oxyhydroxide chimney that is growing up from an area of extensive Fe-oxide crust. Very light and fragile, strong red-brown colors.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1040</td>
<td>7</td>
<td>J2-1040-7-CH1</td>
<td>250-253 = DNA extract</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>254-259 = Cryovial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>260-262 = Serum tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>263 = whirlpack</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>8840</td>
<td>No</td>
</tr>
</tbody>
</table>

**Description:** Sulfur chimney, pot #8 (green/white), sulfur chimney, may not be actively venting?, grey cottage cheese with lemon zest :) Sample all used up for microbiology. Sample description as for J2-1040-7-CH2.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1040</td>
<td>7</td>
<td>J2-1040-7-CH2</td>
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<td></td>
<td>No</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>8886</td>
<td>No</td>
</tr>
</tbody>
</table>

**Description:** Sulfur chimney, right side of milk crate
From Cornell: Large sample ~10 cm across. Piece of a subsidiary S-rich chimney as part of a field of them seen inside the pit crater of the Main Cone. Sample is dominated by grey-white matrix that is almost certainly made up of polymorphs of silica, alunite (Al-sulfate), native sulfur and rare small crystals of pyrite. Advanced argillic alteration that we see in the high sulfidation parts of active volcanoes. Of note is the fact that the native sulfur appears ‘globular’ in places suggestive that was once liquid and solidified in the chimney. Probably high levels of SO₂ streaming through the chimney and mixing with seawater formed the native sulfur and alunite while making acid. Very intriguing sample.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1040</td>
<td>7</td>
<td>J2-1040-7-CH3</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Event #</td>
<td>Chemistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8897</td>
<td>No</td>
<td>Lat: -34.88209817</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long: 179.06833579</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hdg: 263.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth: 1208.22m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alt: 4.34m</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description:** Sulfur chimney, right side of milk crate
From Cornell: Sample from same chimney as for J2-1040-7-CH2. Also about 10 cm across with same mineralogy. Still see remnants of molten sulfur inside the sample and in places looks like intense alteration of a rock, though is found distinctly as a chimney. Outside of this and other sample oxidized with Mn ± Fe.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
</table>
| J2-1040         | 8             | J2-1040-8-CH1 | 228-231 = DNA extract  
232-237 = cryovials  
238 = serum tube  
239 = 50cc falcon | 160-192C | No |

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
</table>
| 9260    | J2-1040-8-IGT3  
J2-1040-8-MAJ-Green  
J2-1040-8-IGT5 | Lat: -34.88234384  
Long: 179.06827322  
Hdg: 321.30  
Depth: 1213.51m  
Alt: 1.76m |

**Description:** Sampled hydrothermal rubble using scoop, in pot #6 (red/black), hydrothermal rubble sampled with scoop, sampled soft white areas from top, seem laminated, black sections too hard. From Cornell: Sample dominated by what was molten sulfur. Is black with shiny surface due to molten sulfur being expelled onto seafloor and rapidly chilled. Might have some fine-grained pyrite as we see with molten sulfur samples elsewhere. Sulfur has flowed across the seafloor and picked up small pieces of hydrothermally altered rock. Also has some delicate ‘threads’ of sulfur. Have one small, ~1 cm diameter piece of highly altered what rock which will be alunite mainly. Some small pieces of yellow sulfur.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2-1040</td>
<td>10</td>
<td>J2-1040-10-CH1</td>
<td>24-243 = DNA extract</td>
<td>199.8</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>244-249 = cryovial</td>
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<tr>
<td>Event #</td>
<td>Chemistry</td>
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<tr>
<td>9541</td>
<td>J2-1040-10-MAJ-Red</td>
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<td>Lat: -34.882356</td>
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<td></td>
<td></td>
<td>Long: 179.06826462</td>
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<td>Hdg: 347.68</td>
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<td>Depth: 1214.18</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Alt: 1.54</td>
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<td></td>
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</tbody>
</table>

**Description:** nice small piece from vent, pot #2 (white), small piece from active vent, small sample only for DNA, white soft areas separated from harder rock material.

From Cornell: Collection of 5 or 6 small (<3 cm in size). Samples range from relatively fresh, unaltered lava, to 100% hydrothermally altered lava, to pieces of sulfur crust. See some possible barite(?) in vug of altered sample. Other rock samples not 100% altered show partial alteration of primary feldspars in the original rock.
<table>
<thead>
<tr>
<th>Lowering number</th>
<th>Station number</th>
<th>Sample name</th>
<th>Aliquots</th>
<th>Preliminary Temp. (°C)</th>
<th>RNA Later</th>
</tr>
</thead>
</table>
| J2-1040         | 10             | J2-1040-10-CH2  | 210-213 = DNA extract  
214-219 = cryovials  
220-225 = serum tube  
226 = 50cc falcon  
227, 277, & 278 = serum | No                     | No           |

<table>
<thead>
<tr>
<th>Event #</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>9582</td>
<td>No</td>
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</tbody>
</table>

**Description:** warm, still shimmering, pot #1 (orange), mineral ledge overhanging active venting, very stinky still shimmering upon collection, soft, white material, homogenized all, pH measured with strips was about 2-2.5, neutralized tubes(227, 277, &278) with NaOH

From Cornell: Two pieces; one that looks like very fine-grained, tan-colored fluffy probably silica that was also host to lots of bacteria? The other is similar material, also very light but has formed a crust mantled by black sulfur(?)