Jason Dive J2-211, August 5-6, 2006 (GMT)

08:06 Off Deck
09:23 On Bottom: 3° 43.79'S, 151° 40.05'E, 1670 mbsl
23:56 Off Bottom: 3° 43.72'S, 151°'40.32'E, 1708 mbsl
01:10 On Deck

Aim:
The target of the dive is the Tsukushi (Japanese for "cat tail") hydrothermal area, the southwestern most site of high-T venting within the Pacmanus field in about 1630 m water depth. We plan to sample two solid / fluid sample pairs, one at a site of active venting of high-T fluids near Shinkai Marker "C1" (or wherever most vigorous black smoker activity is observed) and one at a site of fluid venting through oxide structures from an area outside the chimney field (waypoint 2). A fresh volcanic rock is to be collected at waypoint 3 for magnetic and geochemical studies.
The dive should examine and document the extent and characteristics of hydrothermal activity in the area. Samples of sulfides as well as fresh and altered rocks characteristic of the area should be collected. If time allows, the area NE of Tsukushi can be examined for hydrothermal activity to examine the source for Eh anomalies in the ABE survey (see map ABE188 Eh).

Co-ords for the landing site:

- **Lat/long: -3°43.792' S, 151°40.040'E, 1650 m**
- **UTM: 352006, 9587620 (WGS84 Zone 56S)**

Summary

Vanko watch: Seafloor around landing site is sedimented lava. Heading 270 for 80 meters to waypoint 1, we crossed bulbous lava rocks, a wall of big, rough-surfaced pillows and iron oxide staining before reaching the first chimney complex (all inactive) at x1877, y2231, z1656 (vvan#27371). Chimney field extends about 40 m to x1840, y 2220. Most structures are simple, tall pillars (cat-tails) with conical tips, with occasional patches of snails (x1849, y2230, z1652; vvan# 27241). They are all inactive, except for rare diffuse fluids seeping up through oxide stained cracks in the volcanic basement on which the chimneys stand. The sediment cover is generally light.
Bach watch: A survey of the area 30 m N and S of the chimney field does not locate more structures. Diffuse venting though oxide patches and a stubby oxide "chimney" is located around and east of x1835, y2240, z1660 (vvan# 27457). We drop a target here to return for later sampling and continue to the survey along the northern edge of the chimney field. There is venting of 26°C warm diffuse fluids through rubble of a big fallen chimney at x1860, y2240, z1658 (vvan# 27503). We find more chimneys at x1890, y2254, z1659 (vvan# 27589); this is the northeasternmost extension of the field. (Later on in the dive, Marker C1 will be found here.) A survey of the area up to 80 m north of Tsukushi finds no further chimney fields. A steep-sloped block lava flow overlies the flat and sedimented terrain north of the ridge that hosts Tsukushi. A SM2000 calibration was conducted over the flat sedimented terrain, before we returned to the oxide vent field. The oxide field is hosted in a terrain of sedimented knobby lava flow. We surveyed the oxide field and picked a site of most vigorous venting for sampling (x1840, y2237, z1660; vvan# 27795). The temperature probe gives maximum temperatures of 59°C for the vent fluids. Two IGT bottles are fired with temperatures

between 59 and 62°C being recorded (vvan# 27855). An oxide crusted (vvan# 27832, sample J2-211-2-R1) and a fresh volcanic rock sample (vvan# 27956, sample J2-211-2-R2) are taken at this station.

After exploring the area to 50 m SW of the southwesternmost chimney sighting to faithfully establish the spatial extent of Tsukushi, we headed north to take sample of the lava dome that is a local magnetic field intensity low. After crossing the flat terrain of sedimented knobby lava flow we get to the front of a steep-sided block lava flow (x1821, y2256, z1657; vvan# 28054). The block lava terrain steepens considerably around x1840, y2370, z1640 (vvan# 28901) and we start picking up meter-sized blocks of lava and some indication of mass wasting.

Tivey watch:

We climb up the remaining few meters of the volcanic dome. Lava has a knobby/granular texture to the massive slabs and blocks. We reach the summit which has a fine dusting of sediment cover in the swales and coating the knobby lava texture. We take at sample from outcrop (3-R1 x1805, y2440, z1626; vvan 28178). We moved off the dome to the northeast, on course 060. See some yellow staining on lava surfaces (sulfur?). See occasional pillow forms in the lava and an occasional coral. We come across large slabs of lava forming an inverted v-shape groove ahead. There are no fissures or faults seen. We come up to the flank of an individual flow unit which has steep sides and is composed of large blocky massive lava. We climb the flow and head back west to check on the source of this flow unit. Not much is found at its upper end except chaotic lava terrain. This is extremely rugged terrain. Only a slight sediment cover, a cm or so. Turn and head back to east (course 90). Traverse the same type of lava formations as before. We turn north to head up another separate lava dome to the south of the previous one. We reach the top and find more thickly sediment covered lava at 15:46. Eh shows no obvious targets here so we head south (160) and drive off this dome. By 16:10 we are getting into more sediment cover, occasional galathea are seen. We are seeking Eh hits found by Abe but no obvious targets seen. Come up a steep sided lava lobated flow at 16:46 after heading south. Once on top we find a sedimented flat-lying plain. We start to see more biota, mussels, galathea. Finally we find shimmering water in a white stained area. We are adjacent to the Snowcap dome but not on it. At 17:00 we come across a small field of weakly active chimneys. They are mostly extinct (and black) but those leaking shimmering water have a white coating on them. Lots of shrimp crab, paralvinellid worms etc. These chimneys are 4.5 meters tall. We stop here to sample the clear shimmering water chimney but break it into many small pieces, and we keep one small piece (4-R1). We next sample the adjacent inactive chimney which is a much bigger piece (4-R2). The location is x2139 y2428 z1639. We suspect the nav to be off by a few meters as Jason is only using Doppler and not LBL because of the concurrent ABE survey.

Vanko watch: After sample 211-4-R2 was stowed, the temperature of water flowing out of the stump was measured at 173°C. The temperature of the adjacent orifice, the one that was previously noted to be producing fluid, was 177°C. A Jason weight was placed atop the higher chimney stump, and then marker 6 was located at a different chimney about 10 meters away on a heading of about 150°. This allowed a reset of the Doppler, which resulted in a 10-meter hop in the Jason position. We turned and got underway on a 240° heading, passed the chimney with the dive weight, and cruised over some platey old

volcanic rocks, spotted sparsely with white crabs and orange Fe-oxide stains, to a light gray massif of coarsely layered outcrop with discontinuous yellow layers (vvan 28842). This is a native sulfur flow, and it was peppered with snails (vvan 28850) and, in places, hosted small communities of corkscrew-like tube worms (vvan 28932). After sampling (Sample J2-211-5-R1; vvan 28875) we searched for a vent for this flow without real closure. Marker 6 was then found, 15 m north of the sulfur flow. Turning south we noted a gully south of marker 6, the far wall of which is layered/bedded granular material thought to be hyaloclastite (sample 211-6-R; vvan 28953). We went over the sulfur flow again and measured temperature, finding no temperature above ambient. We did see that at least one of the corkscrew tube worms was alive, as it had its frond sticking out.

We headed SW at 250° down the ridge toward Tsukushi, passing old lobate flows. Passing a small depression/crater there was shimmering water associated with oxide deposits, then a chimney complex, 3-4 m high, some white-tipped, but mostly dead and devoid of biology, about 20 m south of the crater (x2105, y2389, z1645; vvan 29144). We measured shimmering water near the base of the chimneys (T = 63°C) and sampled an inactive spire (J2-211-7-R1; vvan 29182). We then backtracked to the oxide deposits just upslope, and measured temperatures of 8, 25 and 28°C. We took an oxide sample (J2-211-8-R1), although Chris Yeats thinks it is an altered rock (vvan 29298).

Underway again on a 270° bearing toward Tsukushi, we saw much shimmering water and Fe-staining, then we moved out of this diffuse flow area into old sedimented lava. Eventually we came upon two groups of dead chimneys, the second having marker C1 affixed to the top at 13 m altitude. This was the Japanese marker that was reported to be on a 27-m chimney, so the chimney has obviously shut down and broken off, too. We decided to get underway on a 084° heading to see a large crater SW of Snowcap, but the next watch changed the plan for the end of the dive.

Bach watch: Watch starts with a 30-minute delay due to ship DP problems. With only about an hour remaining and a set of bottles left unused, we decided to head for Station 4 (Snowcap chimneys) and sample the 177°C discovered earlier in the dive. Crossing slowly over sedimented, mostly flat terrain with occasional large pillows to the onset of rubbly, steeper lava flows with scatter biota (crabs, serpulids) beginning at x2098, y2373, z1650 (vvan# 29652). The oxide field and sulfur flow (vvan# 29692) describe by the previous watch were crossed, before we reached the Snowcap hydrothermal chimney field. Located the sample site of Station 4 and sampled fluid from spire that was sampled. Two IGT bottles were successfully taken yielding temperatures between 172 and 179°C. The temperature on the outside of the chimney inches below where the sample was broken off (vvan# 29791). A Ti bottle was also fired (nice tell tails), before weights were dropped and we left bottom.