

Jason Dive J2-227, August 18-19, 2006 (GMT) W of S Su and NORTH SU III

08:58 Off Deck

09:55 On Bottom: 3° 48.01' S, 152° 06.08'E, 1160 m

00:00 Off Bottom: 3° 48.02'S, 152° 06.02'E, 1200 mbsl

01:05 On Deck

**MAGELLAN 06 Cruise Manus Basin
LEG 2**

Jason Dive #227 – 22 to 23 August 2006 --- Surprise/North Su III

Aim:

The goal of the dive is to explore the area around the landing site for hydrothermal activity and sample fluids and solids, if appropriate. If this area is inactive, we will move to the W flank of North Su and sample fluids and solids there. If time permits, we examine and sample the landslide(?) mound on the S flank of North Su. (If fluid sampling will take place at Surprise, we will sample North Su fluids during dive 228)

Co-ords for the Jason launch:

- **Lat/long: 3°48.70' S, 152°05.62'E, 1750 m**
- **UTM: 399366, 9578641 (WGS84 Zone 56S)**

Vanko: We encounter smoke in the Jason and Medea cameras, together with an Ej drop from 197 to 150, at depths between 1100 and 1200 m below sea level. It clears below 1200 m. We view the bottom at a depth of 1686 m and 20 m altitude – it is flat sedimentary sea floor with a few % volcanic rock cover. The volcanics look like talus, and some have elongate flow-type textures on the outer surface. No biology is evident. Underway on heading 128° toward a ridge about 500 m away, we continue to see sediment sloping up gently, some rocks, and a 1-m fault scarp exposing volcanic rock.

Bach: We continue along the track line with a 128° heading and saw a SE-NW trending fault with a <1m offset separating the thinly sedimented flat we just traversed from more sedimented terrain. Laminated sediments are exposed on that fault wall (x3325, y2141, z1600; vvan# 64827). A lava outcrop (vvan# 64835) 45 m down the transect line is followed by another fault (x3393, y2088, z1566; vvan# 64843), striking SW-NE and, again, showing increased sediment thickness on the hanging wall. After passing by a small ridge of bulbous lava (x3428, y2061), we encountered another fault that trends E-W and has about a 1-m offset, exposing fined-grained sediment, with clasts in the basal parts and sheet flow lava (x3497, y2009, z1546; vvan#64870). South of that fault, the terrain is continuous sediment. We travel SE for several minutes, then turn NE for 80 m along the SE slope of the dome. At x3598, y2009, z1548, we sample of specimen of lava fragment (sample J2-227-1-R1) and scoop-sample sediment (J2-227-1-R2, vvan# 65010) with volcanic clasts where the sediment cover is disrupted in a furrow running down slope. After leaving the bottom for an ABE launch, we continued our survey along a northwesterly line over the top of the dome and through sedimented terrain with rare lava

outcrops, where exposed by sediment slumping. We crossed back into the thinly sedimented lava field we landed on at x3144, y2128, z1566 and stopped the ship to sample fragments of bleached rock. We had to follow the ship for a few 10's of meters to the NNE and came across a lava ridge that also had pieces of bleached rocks and other fragments littering its surface. We picked up two small pieces of altered/bleached rock here (J2-227-2-R1 and 2-R3) and also sampled the apparently fresh lava flow (x3240, y2348, z1643; vvan# 65253). We left Marker 15 at the base of the lava flow (vvan# 65301), because it kept getting in the way of the science cam. We next continued with a NNE-ly heading up slope and crossed increasingly sedimented terrain, where occasional outcrops of volcanic rubble are due to sediment mass wasting.

Having firmly established that area is hydrothermally inactive, we discussed possible next targets with the Tivey team.

Tivey: We began a traverse over to the south flank of South Su to coords x4167 y2398 on a course of 106 at 0.4 kts. This is the location of an area identified by Nautilus as being of hydrothermal interest. Most of the terrain is thickly sedimented with occasional gravel chutes of debris fans. At 14:35 we crossed over a small domal feature with larger meter-size talus. At 14:40 we crossed a zone of curious rubble mounds a few meters high and in diameter. At 15:00 we found some white-stained rocks mixed in with the darker presumably volcanic talus. At 15:03 we began to see broken clam shells/mussel shells. At 15:09 we turned and headed north towards the summit of South Su. We crossed areas of gravelly material as the sediments began to be less prominent. The gravels coarsen up somewhat as we go north. At 15:24 we saw the first crabs covering rocky outcrops and/or talus. At 15:38 we reach the first clear outcrop of volcanic material. We cross over a domal tongue-like feature in the southern part of the ABE 194 map on the south flank of South Su. At 15:51 we found an increasing density of crab and finally found some shimmering water with white bacterial mats and sediment stains. Fauna include shrimp and mussel beds. No snails. We stopped and took a temperature of a small shimmering water vent in white-stained volcanic lava. Shrimp were swimming in the shimmering water. At 15:54 the temperature was a max of 45C (J2-227-3-T1, x4262 y2518 z1371). We continued moving across the flank and moved west and stopped at an outcrop of lava with a broken fault face and took a sample (J2-227-4-R1, x4219 y2531 z1365 DVL Target #43). We moved a little further on and stopped to take a piece of white flange-like material from a talus block that dots the area (J2-227-5-R1 lava piece, J2-227-5-R2 white crust polymict breccia, x4218 y2543 z1363 DVL target #44). We moved on up the slope and saw more of the white polymict breccia material spread around the lava talus. We turned and headed to a depression/hole at the base of the South Su scarp flank and at 16:34 we found a lot of dead clam and mussel shells and what looks like decrepit old sulfide and a smooth flow-like feature that has flowed into this depression all covered in thick white bacterial mats and white-staining. We move northwards and stop to sample what looks like old sulfides with small knobs sticking up. This sample turns out to be a fine breccia with native sulfur droplets (J2-227-6-R1, softer crust; J2-227-6-R2 harder crust, x4276 y2563 z1366). To the north of this there is an extensive area of white staining and bacterial mats covering the seafloor, somewhat reminiscent of Snowcap on Pacmanus. At 16:53 we continued north and into the "crabby" terrain. There are extensive networks of white-stained cracks in the substrate

and occasional areas completely covered by white bacterial mats. No shimmering water or obvious venting is found however. At 17:12 we finally saw our first snails (depth 1329m) and some old sulfide chimneys (17:14). At 17:15 we reached the flanks of the summit ridge on the south side of South Su. We reached the smokers at South Su that were sampled on a previous dive 224. This is where we lifted up off bottom and began a drag over to North Su. At 17:18 we began the move to North Su.

Vanko: Settling down west of the summit, we first encounter much smoke in the water, then descend below this “cloud cover” onto the sedimented scree slope, populated by rocks, crabs, limpets, eels, and biological floc. Water is shimmering. We move toward the target chimneys and encounter a ridge and pillars of rock, meters in diameter and massive, as high as we can see. One pillar in particular stands out, and it turns out to have a well-defined black smoker area active about half-way up from the base (vvan 66122). We will set up here to take a temperature. The pillar looks like it is made up of boulders of volcanic rock. The black smoke is emanating from three small chimneys, each with black “cigar ash” at the top through which the fluid is diffusing (vvan 66159). One chimney is broken off, exposing a nice small orifice, and the T probe measures 299°C. Sample 227-7-R1 is a fragment of the chimney with chalcopyrite, and Sample 227-7-R2 is a piece of rock from the pillar next to the smokers. It turns out that this did not sample the volcanic rocks embedded in the pillar: instead, the sample is anhydrite-rich and sulfide material that seems to be cementing the pillar, making it such an outstanding landform.

The sampled chimney, at 1190 m, is 5 m below the top of this pillar. Rising to the top, we realize that it is the target site of vigorous “flaming” black smokers (at 1183 m depth). We methodically take three fluid samples and attempt to get coexisting solids. Sample J2-227-8-W1-IGT4 had a stable temperature of about 324°C, but the temperature began to slowly climb and reached a high reading of 340°C. The climbing readings, though, may not be real and could be due to the sampler heating up. The second sample, J2-227-8-W2-IGT3, held a steady temperature of 324°C, and this bottle was deliberately kept as far as possible from the hot water. We also took majors sample J2-227-8-W3-M4, which had a good telltale. Now, the orifices here are basically impossible to sample, but we tried anyway with a scoop bag. Whatever the results, there will be some ambiguity as to whether material recovered came directly from an orifice.

Next we moved to the summit in search of more hot fluid. On the way we took a relict spire tip (J2-227-9-R1, vvan 66489). Then, Jeff picked a clear diffuser near the summit, just off the edge of the summit-encircling convex shelf (vvan 66579). This active chimney had a black ashy diffuser at the top (vvan 66603). It was knocked off, a good orifice was exposed, and three good water samples and a rock sample were obtained. Sample J2-227-10-W1-IGT2 and J2-227-20-W2-IGT1 had a maximum and fairly steady temperature of 298°C (vvan 66686). Majors sampler J2-227-10-W3-M2 fired nicely, although we could not detect a telltale, and the plunger/trigger mechanism was abnormally pushed in earlier by hitting an outcrop. But the sampler seemed to work fine. The active chimney sample is J2-227-10-R1, and we took a relict chimney nearby for comparison (J2 227-10-R2; vvan 66812, and the scicam image in vvan 66582 shows it at the right, in relation to the active chimney sampled here).

Bach: We went to examine the nature of two small mounds in the western part of the summit area that were seen, but could not be visited due to white-outs, during dive 223. The northern mound is entirely covered in white bacterial mats, but is dissected by faulting on its northern and NE side, providing an opportunity to sample the basement underlying sulfides at the summit. Sample J2-227-11-R1, a suspected volcanic rock, is collected here (x3822, y3691, z1159; vvan#66891). On recommendation of Chris Yeats, we headed back to the black smoker site on the W flank of N Su to sample altered volcanic basement hosting the black smokers there. Our attempts to break rock off vertical walls exposing volcanic basement between active chimneys (e.g., vvan# 66952) remain unsuccessful and we settled for a piece of volcanic talus from the base of the structure (sample J2-227-12-R1, x3765, y3692, z1185; vvan#66990). With the primary sampling tasks of the dive being accomplished, we decided to examine the nature of the crescent-shaped ridge and the SE flank of N Su, which we expect to be a landslide feature. We have to come up 30 m off bottom during the transit, because of continuous white-outs. In the target area, extremely thick white bacterial mats (e.g., vvan# 67114) make it very hard to determine the type of rock that forms the NW facing wall of the ridge. When attempting to sample rock forming steep cliffs, we realized, that the ridge is composed entirely of sediment. Closer inspection of areas where recent mass wasting has removed the bacterial mats reveals that the sediments have cm-sized angular volcanic clasts. One of those clasts was recovered (J2-227-13-R1, x3865, y3509, z1229; vvan# 67169), before we fired a Niskin bottle and aborted the dive.