August 2, 2004

IODP EXPEDITION 301: JUAN DE FUCA HYDROGEOLOGY WEEK 5 REPORT

OPERATIONS

HOLE 1301B: 47° 45.2286‘ N, 127° 45.8262’ W; Water depth: 2667.8 mbrf

RCB coring into basement: During this week, we continued coring into basement at Hole 1301B. For our second bit run, we lengthened the BHA to allow coring up to 186 m beyond the 10-3/4 inch casing shoe without exposing the smaller diameter pipe above the BHA to open hole. We reentered Hole 1301B for the 9th time at 1900 hr on 25 July. The bit encountered an obstruction inside the 10-3/4 inch casing at 2918.2 mbrf. We had to use the top drive to rotate the bit before it would pass by the obstruction. This obstruction was not seen on either of our first two trips down through the 10-3/4 inch casing. After lowering the bit to the bottom of the hole, at 0030 hr 26 July we resumed RCB coring. By 0630 hr 29 July, we had cored to 3200.0 mbrf (532.2 mbsf) with only minor hole problems and a single wiper trip. After retrieving Core 1301B we began to trip out of the hole to change the bit at 0815 hr. We used the bit to check the problem zone inside the 10-3/4 inch casing but saw no indications of any problems between 2918.0 and 2924.0 mbrf. At 1530 hr 29 July the bit was back at the rig floor and we began assembling the next bit and BHA. For our third bit run, we extended the BHA once again so that we could advance the bit up to 268.5 m beyond the 10-3/4 inch casing shoe without exposing the smaller diameter pipe above the BHA to open hole. We reentered Hole 1301B for the 10th time at 2310 hr 19 July. Once again the bit encountered an obstruction inside the 10-3/4 inch casing. This time it was at 2926.0 mbrf, 8 m deeper than the first time. The pipe was again rotated through the obstruction without difficulty. It was clear that we had a potentially serious problem with the casing. We resumed coring at 0415 hr 30 July and continued coring until Core 1301B-36R was on deck at 1400 hr 31 July. We decided to cease further penetration to ensure we had time to deal with any uncertainties associated with the remainder of the expedition objectives.

Distress Call: While finishing coring, the ship’s radio officer picked up a distress call communication between the US Coast Guard and a sailboat. The boat was ~31 nmi west of the *JOIDES Resolution* and was taking on water. We advised Coast Guard of the time required to recover drill pipe and reach the location of the emergency. We also offered the use of our helideck and helicopter fuel if required for rescue operations. The US Coast Guard out of Port Angeles, Washington handled the situation and our assistance was not required.

Preparations for Wireline Logging: The final depth of Hole 1301B is 3250.6 mbrf (582.8 mbsf) with penetration of 317.6 m below the top of basement. We conducted a wiper trip in preparation for logging. No problems were experienced and only 8 m of soft fill were easily circulated out. The bit was pulled back up into the 10-3/4 inch casing and we checked the interval where we had encountered an obstruction in the casing again. The obstruction at 2926.0 mbrf was still there. The bit was pulled clear of the reentry cone, the ship offset 20 m, and the bit was released at 0130 hr 1 August. We reentered Hole 1301B at 0147 hr. The end of the pipe encountered the obstruction in the casing at 2933.0 mbrf (265.2 mbsf) where we needed the top drive to rotate past it. At 0415 hr 1 August we began rigging up for wireline logging.

SCIENTIFIC RESULTS

RCB-coring in Hole 1301B: During this week we continued coring deeply into upper oceanic crust at Hole 1301B. We finished with coring and the next operations are to collect downhole wireline logs, conduct hydrologic (packer) tests, and install a multi-level CORK installation.

Cores 1301B-11R to 36R: 424.4 to 582.8 mbsf (159.24 to 317.64 m below the top of basement) cored 158.4 m and recovered 48.02 m (30%). Rocks recovered are predominantly pillow lavas, with many pieces having curved, glassy chilled margins and radial, clay, filled, fractures. The pillows are aphyric to phyric, phenocrysts are plagioclase, clinopyroxene, and olivine (altered to clays). The pillows contain celadonite, saponite, and iron oxy-hydroxide veins the majority of which have alteration halos (black, green, and mixed). Lava flows (up to 4 m thick) recovered in Cores 1301B-11R to -13R, -15R and -18R are plagioclase phyric, with glassy chilled margins and vesicular upper portions. They are slightly altered and contain saponite, pyrite and carbonate veins. Veins include radial cracks along the pillow margins, thin veins, and a few that are >1mm thick. Vein dips are commonly >70° and reorientation using paleomagnetic data is in progress.

One sample per section has been analyzed for thermal conductivity, *P-WAVE* velocity and index properties. Thermal conductivity values range from 1.2 to 1.8 w m^{-1} k^{-1} (mean = 1.7 w m^{-1} k^{-1}), P-wave velocities range from 4.3 to 5.9 km s^{-1} (mean = 5.4 km s^{-1}), porosities range from 2 to 9% (mean = 6%), and the average bulk density is 2.8 g/cm^3. A single sample of breccia at the top of the section had a porosity of 30%.

More than 100 samples have been analyzed for paleomagnetics and virtually all samples give steep, positive inclinations (~45° - 65°) which we interpret as normal magnetization. We rarely get a negative inclination, but always as an isolated sample, which we attribute to an inverted sample as would be expected from the relatively low recovery and use of relatively short lengths of pieces of core.

We have obtained 38 basalt samples for microbiological analyses from representative lithologies with special focus on rocks containing volcanic glass, veins, or other features of heterogeneity or potential fluid flow. We used perfluoro-carbon tracers (PFT) in the drilling fluid for ~50% of the cores taken. Successful delivery of PFT was confirmed by detection on rock surfaces; direct analysis of veins within the rocks indicate minute to no contamination by drilling fluids implying the possibility of obtaining indigenous microorganisms. A wide variety of sampling and cultivation strategies are being utilized by the different microbiologists including over 270 inoculated cultures in 12 different growth media at 5 different temperatures. In some of the cultures growth of thermophilic bacteria has been detected via microscopic inspection. For shorebased analyses, 36 samples were frozen for DNA/RNA extraction, 28 samples for both SEM/TEM and FISH analysis, as well as 18 for the extraction of biomarkers and activity measurements.

EDUCATION

The fifth weekly installment of the Teacher-at-Sea's daily journal (text and photo) has been sent to shore. The lab brief for the Chemistry lab is undergoing final shipboard editing and will be sent to shore this week. Next lab brief will cover either the Physical Properties or Core Description lab.

TECHNICAL SUPPORT AND HSE ACTIVITIES

IODP technical staff has concentrated on hard rock core archiving, processing, and sampling. Thin section production and ICP/XRD sample preparation and analyses are in progress. An evaluation of ICP standards and the accuracy of one of the Scientech balance systems is in progress. No problems have surfaced other than a drill press which requires replacement. An ice buildup in the cryogenic magnetometer identified by trying to conduct a whole-round measurement (which it prevented) was cleared with warm air.

In support of the upcoming downhole logging, the GI-sound source was prepared and the firing circuits via the Schlumberger logging control unit were tested. From the technical side, the experiment is now ready with a 12-hour notice. A meeting to review the logging plan was held. The Lab Officer communicated the activities required to abide by our current Marine Mammal Policy (MMP). We will be required to conduct GI-source operations only during daylight hours and when we have good visibility. Following the meeting, the MMP was distributed to all shipboard science party members and IODP staff and supporting materials and binoculars were delivered to the bridge officers.

As possible, we are taking advantage of a planned helicopter transfer to obtain some additional lab supplies. The Electronic Specialists diagnosed and repaired the pycnometer which had an unstable pressure error. Computer System Managers began focusing their attention on the end-of-leg plan and procedures, replaced a failed network file/print server (requested replacement via helo), and updated documentation and information on the MCS internal-use web page. Programmer Specialist finalized workflow for scientist access to digital close-up core photographs and conducted a myriad of data quality control activities.

HSE: A fire drill was conducted 26 July with a simulated fire at the incinerator. The science and technical staff reported to their lifeboats where another 6 individuals per boat where introduced to safety, survival, and communications features. A safety memo was circulated in response to a toe injury that was preventable had suitable footgear been worn. A diluted formaldehyde spill in the microbiology clean hood was cleaned up and IODP staff and science participants were reminded of pertinent safety procedures. The welders are replacing safety chains with pipe gates, to surround the top-level hatch access site. The waste management plan has been successful, materials not disposed of in the incinerator are being stored for disposal at the next port call. The Marine Mammal Policy procedures are being implemented in anticipation of conducting a VSP.

Core recovery: 64 m

Samples collected: 388 (although many have been subdivided for multiple analyses)