August 10, 2004

IODP EXPEDITION 301: JUAN DE FUCA HYDROGEOLOGY
WEEK 6 REPORT

OPERATIONS

HOLE 1301B: 47° 45.2286' N, 127° 45.8262' W; Water depth: 2667.8 mbrf
Wireline Logging in Hole 1301B: After preparing the hole, releasing the bit on the seafloor, and placing the end-of-pipe near the base of the 10-3/4 inch casing, we began rigging up for wireline logging at 0415 hr 1 August. We deployed four wireline tool strings in Hole 1301B in the following sequence Triple Combo, Ultrasonic Borehole Imager (UBI), Formation Microscanner (FMS)/Sonic, and the Well Seismic Tool (WST). The Triple Combo reached 578 mbsf (4 m from the bottom of the hole) and logged up past the casing shoe at 346 mbsf. The UBI and FMS/Sonic strings could not pass below ~82 m below the casing. The UBI and the FMS data from inside the 10-3/4 inch casing confirmed an ~10 m gap in the casing. The last log was a vertical seismic profile (VSP) with the WST. All logging operations were completed at 1500 hr on 2 August and we moved the ship back to Hole 1026B while retrieving the drill string.

HOLE 1026B: 47° 45.7571' N, 127° 45.5482' W (final); Water depth: 2666.1 mbrf
Retrieval of ODP Leg 168 CORK and ROV platform: We use the CORK pulling tool and removed the old Hole 1026B CORK from the reentry cone structure at 0545 hr on 3 Aug. When the hardware was recovered on the ship it took 3 hours to disassemble and layout all the various components.

Installation of new Hole 1026B CORK: At 1500 hr 3 August, we began to prepare for assembling 4-1/2 inch casing string. The CORK is described below in the Scientific Results section. The CORK assembly was lowered to the seafloor, and we deployed the camera/sonar system to prepare for reentering Hole 1026B to install the CORK. Just before reentering, we observed a long white foreign object lying inside the reentry cone. We ultimately determined that the object was likely a BioColumn sampler lost (fell through a flow hole in the old style ROV platform) during a submersible visit following Leg 168. Two fishing trips were successful in retrieving pieces of the BioColumn. When we were ready to reenter, we observed some more pieces remained inside the throat of the reentry cone resting on top of casing hanger assemblies. We lowered the 4-1/2" casing into the throat of reentry cone in an attempt to dislodge it so that it could fall freely to bottom however the casing worked past the object and it eventually became jammed onto a stabilizer on the CORK. We pulled the casing clear of the reentry cone, offset the ship, and ran the camera frame over it until it fell off. Finally, we reentered Hole 1026B at 1945 hr on 4 August and the CORK and internal instrument string were successfully installed. We installed the ROV platform and then ran the camera system down to inspect the installation and observe the release of the CORK running tool (1125 hr 5 August). The ROV platform had hung up on one side of the CORK head. We used the running tool to nudge the high side of the platform and it dropped into place on top of reentry cone at 1130 hr.

HOLE 1301B: 47° 45.2286' N, 127° 45.8262' W; Water depth: 2667.8 mbrf
Remedial cementing of 10-3/4 inch casing: We moved back to Hole 1301B while retrieving the drill string. Our next step was to attempt to align and cement in place the detached 10-3/4 inch casing. We fabricated a custom cementing assembly and used it to pump high-viscosity gel mud and then thickened cement. We kept the 1 stand of drill collars inside the lower section of 10-3/4 inch casing for 7.75 hours to keep it aligned while the cement began to harden. The BHA was back on the rig floor at 1700 hr 6 August.

HOLE 1301C: 47° 45.2799' N, 127° 45.800' W; Water depth: 2667.4 mbrf
APC-coring at Hole 1301C: We cored the sediment section at Hole 1301C to collect high-quality APC-core samples for geochemical and microbiologic studies. At 1700 hr on 7 August, we started assembling an APC-coring bottom-hole assembly. We cored continuously from the seafloor to 119 .1 mbsf (Cores 1301C-1H to -13H). After that, we alternately cored and drilled ahead without coring to ensure we had sufficient time to obtain the deepest sediments. We penetrated a total of 265.3 m, cored 166.8 m, and recovered 143.29 m (86%). We pushed the APC coring system beyond its routine operational limits to obtain APC cores from the deepest sediments above basement. Cores 1301C-15H and -16H extended from 178.1 to 197.1 mbsf and recovered 11.87 m (62%). After drilling ahead to 235.8 mbsf, we took Cores 17H to -19H from 235.8 to 255.3 mbsf in the pelagic section just above basement. These cores recovered 24.19 m (85%) and terminated just decimeters above basement. Five temperature measurements were attempted (APCT, DVTP), but at least 3 of these yielded poor-quality data due to tool motion or due to being pushed into poorly-consolidated sand.

Helicopter transfers: On 7 August, we had two helicopter transfers (1120 and 1719 hr). These provided essential hardware to raise the Hole 1301B CORK head an additional 2 m above the reentry cone. The transfer was also used for miscellaneous lab supplies and for disembarking a TSF employee (non-emergency medical).

SCIENTIFIC RESULTS

During this week we (1) collected downhole wireline log data in basement at Hole 1301B, (2) replaced the CORK at Hole 1026B that was originally installed during Leg 168, and (3) piston cored the sediment section at Hole 1301C.

Wireline logging in Hole 1301B: We logged Hole 1301B with the Triple Combo (spontaneous potential, temperature, natural gamma-ray, density, photoelectric effect, caliper, porosity, resistivity), Ultrasonic Borehole Imager (UBI; spontaneous potential, temperature, total gamma-ray, acoustic borehole images), Formation Microscanner (FMS)/Sonic (spontaneous potential, temperature, total gamma-ray, sonic velocity, resistivity images) and the Well Seismic Tool (WST; seismic velocities). The Triple Combo covered most of the hole, but the other tool strings could not pass below 3095 mbrf. Most of the data have been processed onshore and returned to the ship for initial interpretations, however the FMS and UBI data require additional processing. The Triple Combo calipers indicate an irregular borehole in the upper 100 m and quite consistent borehole diameters (~10-inches) in the lower section; the Triple Combo data are of very high quality in this lower section. Compressional-wave velocities are generally ~5400 m/s but range up to 6000 m/s. Vertical seismic profile (VSP/WST) stations at 3075, 3050, and 3025 mbrf provide upper-basement interval velocities of 5220 m/s. The wireline logs provide essential information regarding borehole conditions that is invaluable for guiding the design of the subsequent hydrologic (packer) experiment and CORK installation.

Replacing Hole 1026B CORK: Hole 1026B was drilled and cored during ODP Leg 168 to 295.2 mbsf penetrating 48.1 m into basement. On Leg 168, a combination of 10-3/4 inch casing and metal liner (drill pipe) was installed to proved hydrologic access to the upper 31.8 m of basement. Instruments initially deployed with the CORK included a thermistor string, OsmoSampler (OS), pressure gauges, and a data logger; these instruments were recovered in 1999, except for the OsmoSampler and a sinker bar, which were stuck in the hole either inside the liner or between the liner and the casing.

After recovering the existing CORK, we installed the new CORK comprising the CORK head with 4-1/2 inch casing extending to 201.5 mbsf. A single 4-1/2 inch casing packer was set in the existing 10-3/4 inch casing. An umbilical extending from below the packer to the CORK head at the seafloor consisted of a single _-inch packer inflation line and three _-inch pressure-monitoring and fluid-sampling lines. Through the 4-1/2 inch casing of the CORK, we deployed a retrievable instrument string including three OsmoSampler packages (copper coils for gas sampling, Teflon tubing for fluid sampling and tracer injection, microbiological incubation substrate, acid-addition OS for metals analyses, temperature logger). We have now completed our second step toward creating a three-dimensional observational network in upper oceanic basement on the flank of the Juan de Fuca ridge.

APC-coring at Hole 1301C: The cores were extensively sampled for microbiological and geochemical studies on the catwalk and are just starting to be described and analyzed in the lab.

EDUCATION

The sixth weekly installment of the Teacher-at-Sea's daily journal (text and photo) has been sent to shore. The Chemistry Lab brief is undergoing final shipboard editing and will be sent to the shore this week. The Physical Property lab brief will be accomplished next. The Teacher-at-Sea has been observing all of the labs, and especially sediment core processing and squeezing/analysis of interstitial waters. The Teacher-at-Sea has also been assisting with sediment core description.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Lab activities: The week started off with IODP technical staff supporting the deployment of the Hole 1026B CORK and OsmoSampler/Thermistor string. Final preparations for sediment coring were made and they have spent the last two days supporting sediment core archiving, processing, lab analyses, and sampling. Temperature tools (APCT, DVTP) were prepared and deployed. The core entry benches were outfitted to support the microbiology and geochemistry sampling including installation of nitrogen gas cylinder to purge sample containers, liquid nitrogen for quick freezing samples, and a chain vice for subsampling core sections.

ICP hard rock sample analyses were completed just before arrival of sediment cores and the requirement to switch to porewater analyses. Heavy and steady nitrogen use for ICP and the microbiology glove box required continuous and

full-capacity use of the nitrogen generation system and booster pump; the booster pump eventually failed and had to be replaced.

All IODP technical staff have been very busy with the normal lab startup challenges encountered when initiating sediment cores processing; none have caused any serious problems. We have turned off the p-wave logger on the MST due to a problem that can't be fixed immediately. A new standard (red gelatin) has been fabricated for thermal conductivity as it has essentially the same properties as water but does not convect. In the thin section lab, three vacuum pumps were serviced. Only a few thin sections of the sediments are yet to be done. All digital images of cores, close-ups, and photomicrographs are on line and accessible via web for scientific use.

IODP staff developed a coordinated End-of-Leg activity calendar and it has been distributed to all scientists and staff.

HSE: A scheduled fire drill was conducted during logging operations and consisted of a simulated fire on the helicopter deck. Those not involved proceeded to their lifeboats. We implemented the procedures documented in the IODP-USIO Marine Mammal Policy that are required when we using the seismic source for the VSP experiment. The VSP was conducted on 2 August. Due to some technical issues on the logging side, the start of operations was during daylight hours. The weather, initially low visibility due to intermittent bands of fog, dissipated by the time we needed to begin observations in advance of the seismic source use. The seismic source was placed in the water and ramped up per MMP policy. The weather conditions began to deteriorate, but luckily this coincided with the end of the experiment. No whales or dolphin were observed during the experiment.

Core recovery:	69 m
Samples collected:	490 (although many have been subdivided for multiple analyses)