

October 24, 2005

**IODP EXPEDITION 311:
CASCADIA MARGIN GAS HYDRATES
WEEK 8 REPORT**

OPERATIONS

HOLE U1325B: After pulling the drill pipe back to 1,000 mbrf, the ship was moved 5.5 nmi in DP mode from Site U1328 to Site U1325, arriving at 14:30 hr on 17 October, 2005. Hole U1325B was spudded with the APC system. When trying to recover Core U1325B-2H, the inner core barrel became stuck near the drill bit and it took several hours to work the core barrel loose. The second APC core contained a relatively large amount of fine sand, which probably contributed to the problem. After replacing part of the barrel assembly and re-terminating the coring wireline, an XCB core barrel was deployed to work the hole below the sand section identified in the second APC core. The hole was advanced by combination of APC, XCB, and pressure coring to a depth of 206.5 mbsf. At 71.5 mbsf we had an incomplete stroke of the APC for Core U1325B-8H and switched to XCB coring. Interspersed with the XCB cores was a DVTP run at 140.5 mbsf, which yielded high quality temperature data. Five pressure cores were deployed in Hole U1325B. The first pressure core (PCS) was taken at 82.4 mbsf but did not return with a pressurized core. An HRC was deployed at 129.9 and 197.4 mbsf but both did not return core under pressure. We also deployed the FPC at 169.4 mbsf, but it did not retrieve a pressurized core. The last PCS was deployed at 206.1 mbsf but the tool became jammed in the BHA after penetrating just 40 cm into the formation. We were unable to retrieve the tool despite four attempts and we had to terminate Hole U1325B and trip the pipe back to the surface clearing the seafloor at 21:25 hr on 19 October, ending Hole U1325B.

HOLE U1325C: After extracting the stuck PCS and checking for potential problems with the BHA, the drill string was tripped back to the seafloor, and Hole U1325C was spudded at 08:20 hr on 20 October. The hole was drilled to a depth of 188 mbsf where coring recovery in Hole U1325B began to deteriorate. Coring operations resumed with the deployment of the XCB system at 21:15 hr. XCB coring operations, interspersed with two pressure coring runs and a DVTP deployment, deepened the hole to TD of 304.3 mbsf with the last core on deck at 07:15 hr on 22 October. The FPC pressure core was deployed at a depth of 217.6 mbsf, but it did not return with sediment under pressure. The PCS pressure core was successfully taken at a depth of 256.1 mbsf.

During the previous evening and early morning hours of 22 October, sea state had severely deteriorated resulting in a sustained ship heave of 5 m. After reviewing the weather forecast and discussing options, we decided that two separate logging runs would be attempted with tools without calipers to reduce the potential risk of damage to the tool strings. The first run included the phasor Dual Induction Tool (DIT) and the Hostile Environment Gamma Ray Sonde (HNGS). The second run included the Dipole Sonic Imager, (DSI), the Scintillation Gamma Ray (SGT) tool and the Temperature/Acceleration/Pressure (TAP) tool. We were only able to lower the first tool string to 259.8 mbsf, which is 44.5 m shallower than total depth for coring, and the hole was successfully logged followed by some difficulty re-entering the drill pipe. The second tool string (sonic without the FMS) was deployed and was only able to reach a TD of 185.8 mbsf and the available hole was logged successfully. The repeat pass of the sonic tool string reached 183.0 mbsf. After rigging down logging, the bit was pulled clear of the seafloor at 02:00 hr on 23 October, ending operations in Hole U1325C.

HOLE U1325D: To ensure that a mudline core was obtained at this site, one APC core was taken with the bit at 2200.0 mbrf. Core U1325D-1H recovered 4.69 m, indicating a seafloor depth of 2193.2 mbsl (2204.8 mbrf). This suggested that Hole U1325B did not recovery the mudline and was initiated ~1.4 m below the seafloor. The drill pipe was pulled clear of the seafloor at 04:30 hr on 23 October, ending operations at Site U1325.

SCIENCE

At Site U1325, located at a water depth of 2193 mbsl within the first slope basin of the Cascadia margin transect established during Expedition 311, we recovered a 304.3 m-thick sedimentary section of Quaternary dark gray to dark greenish gray fine-grained detrital sediment (clay and silty clay). Silt and sand layer abundance and thickness (a few millimeters to several meters) decrease down the holes cored at this site. Intense microbially mediated organic matter remineralization results in a shallow sulfate/methane interface, ~4-5 mbsf. Unlike other sites drilled on this expedition, interstitial water (IW) chlorinity increases with depth, reaching constant values of ~600 mM with discrete freshening excursions that are typically associated with gas hydrate occurrence. The gas chemistry at Site U1325 is also unusual compared to all other sites visited so far on this expedition, in that it shows only very small amounts of ethane and other higher hydrocarbons in the sampled void and head-space gas samples. The C₁/C₂ ratios are the highest measured so far with values consistently above 10,000 for the entire cored interval. In Core U1325B-10X (~73 mbsf) we found the first evidence of gas hydrates at this site with the occurrence of several small IR imaged cold spots, which also coincided with IW freshening. Below this depth, evidence for presence of gas hydrate was found in most cores to a depth of ~240 mbsf. Typically, IR identified cold sections were associated with sand layers showing a strong lithostratigraphic control on gas hydrate occurrence at this site. The BSR was seismically predicted at a depth of about 230 ± 5 mbsf, but downhole temperature measurements predict the base of gas hydrate stability for the core derived pore-water chemistry at 270 ± 20 mbsf. The comparison of the IR-inferred gas hydrate occurrences with those indicated by LWD/MWD and wireline logging suggests only small (if any) lateral discontinuities between the holes drilled at this site, which is in contrast to the last two visited Sites U1328 and U1327. Out of the seven deployments of pressure cores at Site U1325, only one yielded a core under pressure, PCS Core U1325C-10P. Results from the degassing experiment indicate that at the depth of recovery (256 mbsf) methane gas occurs only in solution and not as a free gas or gas hydrate phase. </p>

TECHNICAL ACTIVITIES

Week eight saw coring, deployment of downhole tools, and wireline logging. The labs were operational and running well. The Canadian marine mammal observer, Scott Toews left the vessel on October 18 via helicopter.

HSE Activities: A fire and boat drill was held on 24 October. The METs team did not respond, as they were busy handling core.