October 30, 2005

IODP EXPEDITION 311:
CASCADIA MARGIN GAS HYDRATES
WEEK 9 REPORT

OPERATIONS

HOLE U1326B: After completing Hole U1325D, we pulled the drill pipe back to ~1600 mbrf and transited ~2.8 nmi in DP mode to Site U1326. We spudded Hole U1326B at 12:05 hr on 23 October, but the core contained only 1.55 m of sediment, which was not ideal for planned shallow microbiological and geochemical studies, hence we terminated Hole U1326B.

HOLE U1326C: The bit was set at 1834 mbrf (two meters lower than Hole U1326B), and without offsetting, Hole U1326C was spudded at 12:45 hr. The first core recovered 3.93 m of sediment, indicating a seafloor depth of 1828.0 mbsl (1839.6 mbrf). On the fourth APC core (~ 30 mbsf), we unexpectedly hit APC refusal and switched to XCB coring. XCB coring advanced the hole to a depth of 82.7 mbsf, which was followed by three consecutive pressure core deployments within a high electrical resistivity zone identified on LWD/MWD downhole logs. The first pressure core system deployed was the FPC, which recovered a partial core (15 cm) at less than full pressure. The second system to be deployed was the PCS, which recovered a partial core under pressure. The third pressure core system deployed was the HRC, which was damaged at the bottom of the hole because of excessive ship heave (>4 m) and formation sands packing around the outer barrel. The HRC cutting shoe had unscrewed and was left behind in the hole, which resulted in the termination of Hole U1326C at a total depth of 86.7 mbsf.

HOLE U1326D: After tripping the BHA back to the seafloor, the ship was moved 30 m to the southwest. Hole U1326D was spudded at 11:30 hr on October 24 and drilled to a depth of 78.8 mbsf in preparation for continued coring operations. Because of problems associated with the heave state, which continued to grow through the day, we decided to suspend all pressure coring operations for the remainder of the expedition to avoid the risk to the tools and potentially losing the last hole with little remaining operational time remaining. XCB coring deepened the hole to 271.4 mbsf with an average recovery of 63.3%. With forecasts of deteriorating weather conditions on the morning of 26 October, it was decided to stop coring at a depth of 271.4 mbsf and deepen the hole to a total depth of 300 mbsf by drilling, which allowed us to gain time and complete logging, rigging down, and securing the rig floor before the expected arrival of the forecasted storm. Despite the conditions, we did attempt three deployments with the DVTP tool (at 252.2 mbsf, 271.4 mbsf, and 300 mbsf), which yielded marginally useful data.

We then conducted a single downhole log run with a non-standard IODP tool string, which included the Scintillation Gamma Ray (SGT) Tool, Phasor Dual Induction (DIT) tool, and the Dipole Sonic Imager (DSI). The tool was lowered to 298.4 mbsf, and two successful passes were made from this depth, and the tool was back on deck at 03:45 hr. The drill string was pulled clear of the seafloor at 05:30 hr on 27 October, ending operations in Hole U1326D.

TRANSIT TO VICTORIA: After tripping the drill string to the rig floor, recovering two beacons, and securing the ship for transit, we departed under deteriorating sea state (with 40-45 kt sustained winds gusting to >50 knots) at 13:20 hr on 27 October. We made the 157 nmi transit to Victoria, B.C. at an average speed 6.8 kts. Expedition 311 officially concluded with the first line ashore at 12:25 hr on 28 October, 2005.

SCIENCE

At Site U1326, located on the first westernmost uplifted ridge of accreted sediments (~1828 mbsl), we recovered a 270 m sequence composed of Quaternary fine grained (clay to silty clay) detrital sediments with varying input of thin silty and sandy interlayers interpreted as turbidites. Soft sediment deformation and dipping strata are present through part of the cored interval. The salinity and chlorinity profiles at this site point to a deeper fluid with a chloride concentration higher than seawater (>585 mM) indicative of low temperature diagenetic reactions in the deeper parts of the site. In the zone extending from ~45 to 270 mbsf (the seismically inferred BSR is at ~230 mbsf), distinct negative thermal excursions in IR scans that are accompanied by excursions to fresher interstitial waters indicate that gas hydrate was present in the cores. These excursions were typically associated with sand layers some of which, in the shallowest samples, contained several larger visible pieces of gas hydrate. The degree of dilution of the interstitial water by gas hydrate dissociation shows a linear decrease with depth, from ~45 mbsf where the lowest chlorinity and salinity values are observed, to about 220 mbsf. This zone of inferred higher gas hydrate occurrence is seen in the LWD log data as interval of high resistivity from ~ 50–100 mbsf, which displays a number of alternating, thin intervals of very high and low resistivity, spanning the range 2-40 Wm. This log response is interpreted as a sequence of thin, sandy gas hydrate-rich layers intercalated with clay-rich layers that may contain little or no gas hydrates.

TECHNICAL ACTIVITIES

Week nine saw coring and logging at the last site followed by cleaning of the labs and preparation for arrival in port.