

October 17, 2005

**IODP EXPEDITION 311:  
CASCADIA MARGIN GAS HYDRATES  
WEEK 7 REPORT**

**OPERATIONS**

**HOLE U1328B:** After completing operations at Site U1327, the ship was relocated ~1.9 nmi to Site U1328. Prior to coring, we conducted a 120 m long camera survey along the proposed coring transect across the vent site to inspect the seafloor for the occurrence of chemosynthetic communities. We did not observe any living clam colonies; however, widespread carbonate outcrops were observed. Hole U1328B was spudded with the APC system at 13:10 hr on October 11, returning a successful mudline core. The estimated seafloor depth is 1267.8 mbsf. Core recovery in the second APC core was only 1.7 m with an incomplete stroke. The next core was taken with the XCB system to the target depth of the first PCS (Core U1328B-4P) at 14.5 mbsf. The APC taken after Core U1328B-4P was again an incomplete stroke with only 1.89 m of core recovered. We switched back to XCB coring and advanced the hole to the target depth for the second PCS deployment (Core U1328B-7P) at 20 mbsf. Both PCS deployments yielded core under pressure. Three more APC cores were taken to 56.5 mbsf when operations were suspended at 03:15 hr on 12 October because of strong winds and severe ship heave conditions. By 07:45 hr conditions had deteriorated to a level (heave > 8 m) necessitating pulling out of Hole U1328B.

**HOLE U1328C:** After waiting on the weather for a total of 16 hours, the sea conditions had improved to the point to allow drilling and coring operations to continue. We offset the ship 15 m and spudded Hole U1328C at 20:30 hr on 12 October, drilling down to the maximum depth of Hole U1328B (56.5 mbsf) to resume APC coring. Hole U1328C was advanced to 75.5 mbsf with three APC cores, where we switched to the XCB coring system. A pressurized PCS core was recovered from a depth of 92 mbsf. The rest of the hole was cored to 300 mbsf with the XCB. The total average recovery for Hole U1328C was 80.3%. Two APC temperature measurements were made with the APC3, and two DVTP temperature measurements were carried out at ~150 and ~197 mbsf, but the data from both runs were degraded by an apparent electronic problem in the tool.

After reaching total depth (TD), the hole was prepared for wireline logging. A successful single pass was made of the triple combo from 294 mbsf. Two passes of FMS-sonic tool were completed from 294 mbsf without incident. After rigging up for the VSP, the marine mammal watch began at 07:30 hr, followed by the 30 minute ramp up of the GI gun at 08:30 hr. The start of the VSP log run began at 09:00 hr with the first clamping position at 286 mbsf. The VSP was run successfully to the shallowest clamping position of 106 mbsf. After pulling the tool back to the rig floor and rigging down logging, the drill string was pulled clear of the seafloor at 16:15 hr on 15 October, ending Hole U1328C.

**HOLE U1328D:** The ship was offset 35 m to Hole U1328D for a high-resolution microbiology and geochemistry study of the sulfate/methane interface. The first two deployments of the APC resulted in bent core barrels and we switched to the XCB coring system. Hole U1328D was spudded with XCB at 19:55 hr on 15 October, followed by a second XCB core, and then deployment of the FPC pressure core at 14 mbsf, which did not recover core. The drill string was pulled clear of the seafloor at 23:45 hr on 15 October, ending Hole U1328D.

**HOLE U1328E:** After offsetting 50 m from Hole U1328D, Hole U1328E was spudded with the XCB at 00:40 hr on 16 October. The primary focus of Hole U1328E was pressure coring, with XCB spot cores to recover gas hydrate from the upper ~ 35 mbsf. XCB coring advanced

the hole to 8.5 mbsf, where the FPC was deployed (Core U1328E-3E), which did not return under pressure. An XCB core was taken, followed by a PCS run at 15.1 mbsf (Core U1328E-5P), which did not return pressurized. Another XCB core was taken and then the HRC was deployed (Core U1328E-7Y), which also failed to return a core under pressure. Two XCB cores advanced the hole to 46.0 mbsf, followed by the deployment of the center bit to drill the hole to 92.0 mbsf. The PCS Core U1328E-10P was deployed, returning under pressure, followed by a DVTP temperature measurement. The center bit was redeployed and the hole was drilled to 197.0 mbsf and the FPC pressure core system was deployed, but the core failed to retract into the autoclave. An additional DVTP survey was conducted at 199 mbsf. The hole was drilled to 215.3 mbsf and the HRC (Core U1328E-12E) was deployed but failed to return a core under pressure. The hole was drilled to 233.0 for a PCS run (Core U1328E-13P), which returned with a core under pressure. With ship heave conditions increasing to as high as 7 m, the planned DVTP deployment at the bottom of the hole was cancelled, ending the hole at 234 mbsf. The hole was displaced with weighted mud and the drill string was pulled out of the seafloor in preparation for the transit to Site U1325.

## **SCIENCE**

Unlike the others sites in the Expedition 311 coring transect, Site U1328 is located within an area of focused fluid flow with massive forms of gas hydrate expected within the top ~35 meters below seafloor. The LWD/MWD resistivity data collected during Hole U1328A operations on 24 September revealed prominent high resistivity intervals within the upper ~35 mbsf. The 300 m thick sedimentary section cored at Site U1328 is Quaternary very dark gray and very dark greenish gray clay and silty clay with varying diatom and foraminifer abundance. Interbeds of sand and silty sand, some with sharp bottom contacts and fining upward sequences, are a minor lithology. The sulfate/methane interface is very shallow in Hole U1328B, between 1.5 and 2.3 mbsf. As expected, numerous gas hydrate pieces were recovered from the upper ~35 mbsf, some measuring up to 5-8 cm in diameter. Pore water analyses from this gas-hydrate-rich section show elevated salinity (48) and chlorinity (853 mM), similar to what was observed at Southern Hydrate Ridge on ODP Leg 204. PCS Core U1328B-4P, recovered from 14.5 mbsf, yielded 22 liters of gas and most likely contained gas hydrate. X-ray images of this pressure core from before and after the degassing experiment showed major disruption of the sediment, especially around X-ray inferred massive gas hydrate lenses. Unlike the upper 35 mbsf cored in Hole U1328B, most of the section within the predicted depth interval for the methane hydrate stability zone in Hole U1328C, is characterized by only subtle IR anomalies, suggesting low gas hydrate concentrations. However, high resolution pore-water analyses of some low-magnitude IR anomalies showed that gas hydrate was preferentially occupying sand layers possibly at higher concentrations. A core recovered from just above the depth of the seismically inferred BSR depth showed significant low temperature IR anomalies. Similarly, the pore water chloride profile is characterized by negative excursions (minimum value of ~350 mM) for the 30 m immediately above BSR depth. Wireline logging resistivity and compression/shear wave acoustic data appear to indicate the presence gas hydrate and free-gas near the predicted depth of the seismically identified BSR at 219 mbsf. In contrast, preliminary interpretation of the observed VSP derived travel times yielded a surprisingly uniform P-wave velocity of ~1640 m/s.

## **TECHNICAL ACTIVITIES**

Week seven saw coring, deployment of downhole tools, and wireline logging. The labs were operational and running well. A VSP was successfully run on October 15 with no marine mammal sightings.

HSE Activities: A fire and boat drill was held on 17 October. All personnel reported to their lifeboat stations.