

January 3, 2005

**IODP EXPEDITION 304:
OCEAN CORE COMPLEX FORMATION, ATLANTIS MASSIF
WEEK 7 REPORT**

OPERATIONS

The week began coring in Hole U1309D (Prospectus Site AMFW-01A) at 252 mbsf. Coring continued through Core U1309D-78R with 74% recovery (64% average recovery for hole). We terminated coring at 401.3 m below seafloor after the RCB bit had accumulated 56 rotating hours. The hole was cleaned and filled with fresh water in preparation for logging. A shallow penetration hole (Hole U1309E) was cored to 3.8 mbsf, 10 m east of Hole U1309D (Core U1309E-1R). Continuing with efforts to capture the oldest sediments draping the central dome of Atlantis Massif, as well as the detachment surface, we moved the vessel in DP mode to a site 275 m NW of Hole U1309D. Hole U1309E was initiated with the RCB and we cored to 4.8 mbsf (Core U1309F-1R). Since RCB coring was not successful in recovering the uppermost basement at either Hole U1309E or U1309F, we tripped the pipe in preparation for logging.

We reentered Hole U1309D with a new APC/XCB bit and our intention was to log the hole, then attempt shallow cores with the XCB. The bit was positioned in the casing, but the logging tools were unable to pass an obstruction at ~ 40 mbsf. Since the XCB bit would not fit in the RCB hole, we terminated the logging attempt and pursued shallow penetration coring. We made a transit in DP mode to an alternate site on the dome, where a submersible dive had located a hard carbonate cap (interpreted to represent the oldest sediment cover on the dome) directly overlying basement. Core U1309G-1X was cored to 3.5 mbsf, but no hard carbonate or recognizable fault rock was recovered. We elected to make a final attempt to recover the lithified carbonate and upper basement with an APC. Only the upper half of the APC barrel returned. Subsequently, we chose to trip the pipe to install a logging bit to guide the pipe past the obstruction in Hole U1309D, and accomplish our logging objectives in that hole. Triple-combo and FMS runs were successful but the UBI run was not attempted since the second FMS pass ended with fallen rock briefly trapping the tool in the hole. The tool was extracted with no significant damage. As the last week of Expedition 304 begins, a final attempt to recover basement from the exposed detachment is being made with the remaining time on site.

Initial Scientific Results

Consistently high recovery rates from Hole U1309D made for an interesting and busy week. The hole was deepened from 252.4 mbsf to 401.3 mbsf and recovery averaged 74% for this interval. Cores U1309D-50R to -78R continue to show interfingered troctolite, gabbro, oxide gabbro, and olivine-rich gabbro, the latter increasing down hole. Evidence of deformation is rare and the intensity of alteration, characterized by greenschist (and lower) facies minerals decreases downward. Numerous thin intervals of serpentinized ultramafic rock (dominantly cumulate dunite) were recovered between ~300-344 mbsf. Hole U1309D was conditioned for logging, including a final pump with fresh water before pulling out of the hole on December 30, 2004.

We offset 10 m east for an attempt (Hole U1309E) to recover the sediment and upper meter of basement using the RCB. The motivation for this and subsequent short holes is two-fold: to check for possible fossils or isotopic signature in the sediments to constrain the exposure age of the hypothesized detachment; to attempt recovery of possible fault rock at the top of the detachment fault. Overcoring in the top interval of the deep penetration holes (Holes U1309B and U1309D) eliminated the chance for recovery from this top section earlier. Disrupted sediments were obtained from Hole 1309E as were several fragments of metabasalt.

The second short-core attempt was made about 280 m to the NW (Hole U1309F) in an area where unconsolidated sediments were less widespread than at Holes U1309B, U1309D, and U1309E, and lithified carbonate cap rock had been mapped with Alvin and Argo in 2000. A brief camera survey confirmed the basic setting although some loose sediment was within a few meter of the tag. Despite clear indications that we drilled about a meter in hard rock, recovery included only disrupted sediment and a few fragments of metabasalt. No chips of lithified carbonate were recognized. We abandoned RCB short hole attempts and switched to the XCB bit.

Additional short core attempts were made 1.7 km to the east (Hole U1309G), in an area characterized by a broad carbonate cap apparently overlying basement. A brief camera survey confirmed this prior assessment and we located the hole within site of a marker left by Alvin in 2000. The hole was spudded into stepped and platy, lithified carbonate sediment. Coring to 3.5 meters using an XCB bit recovered 0.91 m of microfossil ooze, with 3 thin (2-3 cm) interbeds of basaltic hyaloclastite. Glass from the hyaloclastite is oxidized palagonite. No lithified carbonate or intact basement rock was recovered. The sequence of fossiliferous ooze, hyaloclastic deposits, and a clayey material with rounded, largely metabasalt clasts may provide useful post-exposure data. The latter could be a sedimentary conglomerate but we cannot rule out significant reworking due to drilling in this bottom interval.

On completion of work at Hole U1309G, we began preparations for the second logging attempt at Hole U1309D. To avoid the constricted section (~45-50 mbsf), we replaced the XCB bit with the logging bit, which easily passed through. We ran the triple combo tool, and made two passes with the FMS/Sonic tool between ~48 mbsf and the bottom of the hole (401 mbsf). The data quality is very good, hole deviation is minor, and the lower portion of the hole is gauge.

2004 was rung out at mid-night by the ship's bell. The New Year started with flares on the heli-deck, followed by a well-attended dance in the science lounge till dawn. Happy New Year!

Laboratory Status

Core lab personnel reduced the holiday backup and stayed abreast with this week's recovery. In four days this week, recovery exceeded 100 m, one of the low end estimates for the entire cruise. There is tedium cutting core and samples and labeling this much core, leading to errors, which take more time and effort to correct. Thin section production and ICP analysis will continue until we are underway on the 4th.

The Fast Track instrument was tested in its two sensor configuration to the satisfaction of our software developer and physical properties technician. It has been disassembled and will be stored until Expedition 306. There was a late toll on

specialty supplies associated with hard rock recovery that prompted physical counts and alerts to shore. As all freight for the next expedition is in transit, some needed products may be hand carried. This is a little recognized risk sailing similar cruises back to back and from a remote port.

The end of leg shipping and clean up schedules have been circulated.

HSE

The weather was too rough to lower a boat for lifeboat drill. Officers explained the procedures to take if a man overboard alarm is sounded, what the alarm will be and what personnel are to do. The more eyes looking to the sea the better the chance some one might have the victim in view. The Zodiac inflatable boat with an outboard would be launched using the crane to effect a rescue. As we will be underway soon, there was a reminder to not hesitate alerting the bridge if boats are seen, or if lights or perhaps a flare is observed on the horizon. Aged pyrotechnics were disposed of on New Years from the fantail helideck. Those who yearned to launch a signal or parachute flare were given instruction.