

IODP Expedition 335: Superfast Spreading Rate Crust 4 Week 4 Report (2-8 May 2011)

Operations

The cementing assembly was deployed for the third time of the expedition with the bit entering the reentry cone for the eighth time at 1300 h on 2 May. The bit was placed below the unstable zone at 960.5 mbsf and 65 barrels of 15 ppg cement was pumped into the hole. The intent of this operation was to fill and stabilize the washed out and apparently unstable portion of the hole below 922 mbsf. This region was not accessible prior to drilling through the ledge. In accordance with routine, the drillstring was flushed with a large volume of seawater prior to withdrawal from the hole. The drillstring was tripped to the surface, and the bottom hole assembly was recovered by 0315 h on 3 May.

An RCB coring assembly was made up with an RBI C-9 hard formation coring bit, 11 controlled length drill collars, a tapered drill collar, six joints of 5 ½" drillpipe, and associated subs and deployed at 0630 h on 3 May. The bit reentered the cone for the ninth reentry of the expedition at 1235 h. Thought was given to penetrating the cement plug with a center bit, but it was decided that coring the cement would be more efficient and keep the annulus cleaner. The driller tagged the cement at 924.0 mbsf and began coring at 1745 h on 3 May. At 1330 h on 4 May, the cement plug was penetrated and the remaining portion of the hole was washed and reamed to bottom by the early morning of 5 May. Rotary coring in Hole 1256D began at 0145 h on 5 May, which was exactly 16.0 days after arriving on station.

Rotary coring advanced from 1507.1 to 1520.2 mbsf (Cores 1256D-235R to 238R) by 1200 h on 6 May, using non-magnetic core barrels, without liners to reduce jamming and increase recovery. The coring was difficult with occasional erratically high torque. An overpull of up to 60 Kips was frequently needed to keep the drill string free. When the last 2 m of advance required nearly 12 hours, the core barrel was recovered and found only to contain a small pebble. Initially, it was thought that the bit throat was jammed, which is not uncommon in hard rock coring. However, examination of the core catcher sub located at the bottom of the core barrel showed evidence of grinding and abrasion damage indicating a serious mechanical problem at the bit.

The drill string was recovered with the bit clearing the rotary table at 0545 h. The bit was totally unrecognizable. The body of the bit was honed to a smooth profile at the bottom and on the sides. The bit was missing all four cones, four legs, and core guides. The bit spiral stabilizer blades and embedded TCI inserts were also absent. The severity of the damage indicated that the bit had continued to rotate hours after experiencing failure. This failure was masked by the difficult drilling conditions over 5 km beneath the hull.

Before coring could resume, the hardware had to be removed from the bottom of the hole. The first attempt at retrieving the metal hardware was made with a fishing assembly of a Bowen 9" fishing magnet coupled to a tandem set of junk baskets. This assembly was run in with two stands of drill collars and reentered Hole 1256D at 1815 h on 7 May. The fishing assembly was run in without incident to 1295 mbsf where it contacted a

ledge. The top drive was picked up and the assembly was advanced to within 73 m of the bottom (~1434 mbsf), where circulation was lost. All attempts at unblocking the flow path by varying the pump strokes and running pressures as high as 2500 psi with 20 strokes per minute were unable to clear the blockage. Because it would be reckless to attempt to advance any further down the hole without circulation, the drill string was recovered. The magnet, both junk baskets, and bit sub were packed with sand-sized basaltic cuttings mixed with metal shavings and some cement cuttings. This material apparently worked past the float valve during periods of low fluid flow and circulation breaks while making pipe connections. The consensus was that the lower section of the hole needed to be cleaned out to within a couple of meters of the wreckage before a mill or magnet could be effective. A used Atlas tricone bit (IADC type 517) and two junk baskets will be used to wash, ream, and heavily flush the bottom of the hole just above the lost hardware.

Science Results

This week the science party could finally work on the first cores retrieved from Hole 1256D during Expedition 335. Cores 1256D-235R through 238R consisted of approximately 1 m of recrystallized, granoblastic dike material intruded by a few tonalite dikelets. Slight to moderate greenschist facies metamorphism overprints the high-temperature recrystallization. A few shipboard samples were taken for thin section descriptions, geochemical analyses and measurements of physical properties. The science seminar series continued throughout week 4 with presentations by shipboard participants on a range of topics directly or indirectly related to the expedition objectives. Three of our daily science meetings were dedicated to presentations and discussions of the findings of the different science party working groups from their description and analysis of Expedition 312 cores.

Education and Outreach

To augment the current blogging efforts of Benoit Ildefonse and Sarah Saunders on the jr.org site, Deep Earth Academy contracted with Kevin Kurtz (who sailed as Education Officer on Expedition 330) to write blog posts for kids ("jr junior") and highlight teacher resources related to Expedition 335. Kevin uploaded his first blog post on 2 May. The first school video broadcast was successfully completed on 5 May and a second has been scheduled for 10 May.

Technical support and HSE activities

Technical staff provided support for coring operations in Hole 1256D and assisted scientists with special experiments. Other technical activities included support for the DESClogik project, reorganization of gas piping supplies, and continued effort on the science pallet storage reorganization project. Technical cross training continued in the thin section and chemistry laboratories, physical properties and RigWatch systems, and the DESClogik application.

The weekly fire and abandon ship drill was held as scheduled. No incidents to report.