IODP Expedition 335: Superfast Spreading Rate Crust 4
Week 6 Report (15-22 May 2011)

Operations

Given the persistence of cobble-sized material near the bottom of the hole, indicated by the contents of the reverse circulating junk basket of bit run 14, a new Smith 7JS tricone bit was picked up and fitted with 3X15 nozzles and affixed to a 3-stand BHA with the goal of grinding up the remaining loose rock. The drilling assembly reentered Hole 1256D at 0730 h on 15 May. Hard contact was made at a depth of 1518.8 mbsf. From 1415 h on 15 May until 0615 on 16 May the hole was washed and reamed from 1518.5 to 1521.1 mbsf and flushed with 460 bbl. of high viscosity mud sweeps. The bit was tripped to surface after 14.5 rotating hours to ascertain the condition of the bit and assess the progress. The bit cleared the seafloor at 1015 h and the rotary at 1545 h on 16 May.

The cones exhibited virtually no wear except for a chipped insert on the gauge cutter. The bearings were tight with some apparent shirttail wear and minor junk damage present on the big body. These were characteristics of a bit that had done very little actual drilling. When the bit diameter was measured it was found to be under gauge by 7/16". Apparently the bit had been literally squeezed into a smaller diameter hole (< 10'' in diameter). The conclusion was that the bottom ~3 m of the hole were considerably undersized and would have to be reamed to full gauge before fishing could resume.

A tricone was located in the bit inventory that contained the desired hard-facing and leg reinforcement. The sixth tricone bit used during the expedition was selected based less upon cutting structure and more upon the amount of armor on the legs since that would be the area that would receive most of the wear during reaming. A Smith FH3VPS 9 7/8" tricone was made up to a 3-stand BHA without external junk baskets. The bit reentered Hole 1256D for the 16th time of the expedition at 0245 h on 17 May. By 0815 h, washing and reaming operations began. The under-gage section of the hole ranging from 1516.5 to 1519.7 mbsf was reamed for 15 rotating hours and flushed with a total of 260 barrels of high viscosity sepiolite sweeps.

The bit was pulled clear of the seafloor at 0340 h on 18 May and recovered at 0900 h. The tricone bit was found to be in gage. Although the tricone was missing six teeth on the middle row of one cone it was in reasonably good condition. The missing teeth indicated that that cone contact had been made with the debris at the bottom of the hole. During the reaming care was taken to avoid penetrating below 1520 mbsf to prevent metal to metal contact with the RCB bit wreckage and avoid potentially leaving more junk in the hole.

Once the reaming was concluded, a flat-bottomed 9 5/8" mill was made up to the 3-stand BHA with an external junk basket (EXJB) and deployed. The mill entered Hole 1256D at 1850 h on 18 May and initiated milling at 0130 h on 19 May. Shortly after reentering the cone for the 17th time during the expedition, the total length of drill pipe tripped during the cruise passed 100 miles. This milestone was acknowledged by a message of thanks to the Transocean teams from the Shipboard Science Party. Milling progressed without

incident until 1330 h. The driller frequently picked up the tool a little off bottom and decreased the pump pressure to let cuttings settle and be captured in the EXJB. This is referred to as "working the junk baskets." A total of 300 barrels of mud was circulated to flush the hole during milling.

The mill cleared the seafloor at 1920 h on 19 May and was recovered by 0315 h the next morning. The trip out of the hole was suspended for 1.5 hours for the 6th slipping and cutting of the drilling line. The abrasive hard surface on the face of the mill was completely worn away and the diameter of the tool under-gage by 0.5."

The second milling tool run was made with a 9" flat-bottom mill, which reentered the hole at 1415 h on 20 May. From 1945 h until 0145 h on 21 May the bottom of the hole was milled and the junk baskets worked. Based on the excessive wear to the first milling tool, the rotating time for the second mill run was scaled back from 12 hours to 6 hours. A total of 320 barrels of sepiolite mud were circulated to keep the hole clean. The drill string was pulled free of the seafloor at 0645 h and the second milling tool was secured on deck at 1225 h on 21 May. The milling surface was abraded clean and some minor junk damage was noted on the side of the mill. There was also a 3" 200-degree circumferential grove cut into the crossover sub located just above the mill. The EXJB was unloaded and found to contain the usual small cuttings and gravel with some small fresh cuttings of metal. This was the first suggestion that we had finally started to mill bit debris.

The next fishing attempt was made with the third deployment of the RCJB and three EXJBs. This assembly reentered Hole 1256D at 2230 h, on run #19 of the expedition. The tool was run to ~3 m off bottom and the junk baskets worked for ~10 min with the pump strokes as high as 150 spm and standpipe pressure reaching 1850 psi. Following a 100 barrel mud flush, the RCJB was worked to the bottom (~1521 mbsf) with minimum rotation and very light weight on bit. We are presently recovering the drill string.

Science Results

The fishing tools used this week for hole remediation operations continued to recover significant rock material ranging from fine-grained cuttings to large cobbles (up to ~5 kg). Encouragingly reentries were smooth with no difficulties over the last runs, and the fishing tools tagged remaining hard fill at the bottom of the hole without encountering any obstructions on the way down. The hole is now clear of the very large amount of sand-like cuttings that were retrieved last week during several successive fishing runs. On re-entry the entire re-cone is now clearly visible with obvious signs of borehole cuttings deposited on surrounding sediment blanket, indicating much more effective cleaning and pumping of material from the bottom of the hole.

The science party has been occupied describing and analyzing last week's recovered rock material. Because of the large size of some of the samples recovered, contact and textural relationships are being documented that are rarely observed in the usual ~6 cm-wide cores. Overall, they depict a section of metamorphosed sheeted dikes, intruded by a series of small-scale evolved plutonic rocks and minor gabbro. Most rocks are fine grained with

granoblastic contact metamorphic textures, and are slightly altered to amphibole and minor albite, epidote, titanite, and chlorite. Samples are cut by veins of amphibole and minor chlorite, epidote, and quartz. Coarser grained intrusive material is more highly altered to amphibole, albite and titanite. Crosscutting relationships between veins with different compositions, observed both in hand samples and thin sections, have been described in detail. The reduction of the first set of geochemical data is underway.

Education and Outreach

A live ship-to-shore broadcast with several members of the IODP Expedition 335 science party was the highlight of an event at the NSF on Wednesday, organized by Deep Earth Academy staff and former School of Rock participants for 85 kindergarten through 6th grade teachers. The teachers were recipients of the prestigious 2010 Presidential Award for Excellence in Mathematics and Science Teaching (PAEMST). Nine additional broadcasts from the ship to schools in China, France, England, Australia, and the US, are scheduled before the end of the expedition.

Technical support and HSE activities

Technical staff provided support for coring operations on Hole 1256D and assisted scientist with special experiments. Other technical activities included support for the DESClogik project, continued work on the science pallet storage reorganization project, chemistry lab facility upgrades (planning), and completion of a thin section training video.

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