

IODP Expedition 335: Superfast Spreading Rate Crust 4 Week 5 Report (9-15 May 2011)

Operations

The next fishing attempt was made with a used Atlas tricone bit (IADC type 517), a tandem set of external junk baskets (EXJB), and 3 stands of drill collars. The fishing assembly reentered Hole 1256D at 0315 h on 9 May (run 11 of the expedition). The hole was washed, reamed, and heavily flushed with large-volume, high viscosity sweeps. Special attention was given to reaming and washing the ledges found at 1356 mbsf, from 1459 to 1478 mbsf, and at 1520 mbsf. The bit cleared the seafloor at 0605 h and the rotary table at 1130 h on 10 May. The surface of the reentry cone was flushed prior to withdrawal from the hole. The two EXJBs were found to contain material ranging from fine gravel to cobble-size rocks.

The next fishing attempt was made with a 9-3/4" Bowen full flow reverse circulating junk basket (RCJB). The principle of reverse circulation increases the chance of recovery of bit cones, tong pins, hammers, and similar debris. The circulating fluid is jetted outwardly and downward against the full circumference of the hole where it is deflected and directs loose objects into the long hollow barrel of the basket. The unit is activated by the dropping of a stainless steel ball from the surface and does not utilize a float shoe. The RCJB with a Type B mill was made up to a single EXJB and a 6-drill collar BHA and deployed at 1300 h on 10 May. The assembly reentered Hole 1256D at 2330 h (run 12 of the expedition). After the slow circulating parameters were obtained and the hole flushed with a 100-barrel high viscosity sweep, a stainless steel activation ball was dropped into the open pipe and the tool lowered to within a meter of the bottom. Because of the high pump rates and resulting standpipe pressure employed, the landing of the ball in the RCJB was not immediately obvious. The tool was worked for 30 minutes before the drill string was recovered.

On the surface, all 5 8-1/4" drill collars were found to be filled with fine hole cuttings weighting on the order of a few hundred kg. Coarser gravel was also found at the lower part of the BHA in the head, crossover, and bit subs. The RCJB basket contained an array of granoblastic dike rocks with 20 weighing >100 grams. One specimen was 20x10x10 cm and weighted 4.5 kg. It is estimated that the total weight of all rocks in the basket was ~20 kg. The large rocks were probably deposited during the washing, reaming, and flushing of the hole preceding the RCJB deployment and are assumed to be covering whatever remains of the bit cones, bit legs, and core guides at the bottom of the hole.

The second deployment of the Bowen RCJB was made with a Type A mill shoe and reentered Hole 1256D at 1335 h on 12 May (run 13 of the expedition). The tool was run in the hole to 1385 mbsf where the top drive was picked up. The assembly was carefully advanced with rotation and circulation and tagged a hard ledge at 1518 mbsf but was unable to advance past this depth. The steel ball was dropped but activation of reverse circulation was obscured by pump pressure as high as 3000 psi at 50 spm. The drill string was recovered with the RCJB clearing the top of the cone at 0340 h on 13 May. Once on the surface, the BHA was found to be filled with fine cuttings with a volume comparable

to the previous run. The RCJB basket contained 2 rocks with a total weight of 4.5 kgs. The RCJB was cleaned, dressed, and laid down.

The fourth fishing attempt was made with a 9-½” HOMCO flow-through junk basket (FTJB). The FTJB does not employ reverse circulation and has a deeper throat than the RCJB. The FTJB is also deployed with a float shoe that reduces the potential for the inadvertent filling of the inside of the BHA with cuttings. The fishing assembly entered the reentry cone at 2315 h on 13 May (run 14 of the expedition) and was run in to 1521 mbsf by 0815 hr. The driller slowly worked the tool on bottom for 30 minutes before pulling back. Mud flushes totaling 300 bbls were circulated during this process. The drill string cleared the seafloor at 1345 h and was recovered by 2015 h on 14 May. The FTJB contained two rocks of granoblastic dike origin that weighted a combined 3.2 kg. Of the two sets of junk catcher fingers, the lower set was completely devoid of any fingers. Although the FTJB completed the trip to the bottom of the hole, only a fraction of the material snared by the tool was apparently captured.

After reviewing the available options, it was decided that the best way to proceed was to reenter the hole with a hard formation tricone (IADC type 735) drilling assembly and attempt to grind away the approximately 2 m of hard fill overlying the metal debris of the failed core bit. Once the hard fill is removed, the metal debris can be milled down or possibly recovered by the fishing magnet. A new Smith 7JS tricone bit was picked up and fitted with 3x15 nozzles and affixed to a 3-stand BHA. The drilling assembly reentered Hole 1256D at 0730 h on 15 May (run 15 of the expedition).

Science Results

Five bit runs into Hole 1256D with various types of drilling and fishing tools recovered several large (up to 4.5 kg!) cobbles and abundant gravel to sand sized cuttings of different rock types. The rocks recovered are mostly contact metamorphosed dikes that commonly exhibit greater intensities of granoblasticity than similar rocks recovered on Expedition 312. Minor dikelets of gabbroic rocks, some with textures hitherto unseen in previous cores recovered from Hole 1256D, intrude the granoblastic dikes with complex contact relationships that are visible in the larger cobbles and would have been hard to discern in regular drill core. Among the cuttings were a few tens of pieces of steel ~1 cm in size and countless mm-size pieces. Given the persistence of cobble-sized material near the bottom of the hole, a tricone drill bit was made up and is currently grinding near the bottom of the hole. One of the most perplexing aspects of cleaning Hole 1256D has been the invasive surge of angular sand recovered in all available volumes of the junk baskets and drilling collars. Preliminary polished grain mount analyses indicate that these sands comprise lithic fragments from throughout the hole including the lavas. This may suggest that hole remediation activities have remobilized cuttings from previous expeditions that were plastered within irregularities in the ragged borehole walls of the lava sequences. The last junk basket string was mercifully lacking in sand indicating that either the supply has decreased and/or the large mud sweeps are overwhelming the inputs. The science party examined the rocks recovered in the various junk basket deployments and continues the science seminar with presentations on various topics.

Education and Outreach

The second video broadcast was successfully completed on 10 May with two 5th grade classes in Michigan. A third has been scheduled for 22 May with 6th grade science classes at an international school in Shanghai, China. Requests are still being accepted for additional video broadcasts to be scheduled between now and 30 May. Preparations intensified for the live video broadcast to the NSF on 18 May for the White House's PAEMST award recipients (US science and math teachers, kindergarten through 8th grade).

Technical support and HSE activities

Technical staff provided support for coring operations on Hole U1256D and assisted scientist with special experiments. Other technical activities included support for the DESClogik project, continued work on the Science Pallet Storage Re-Organization Project, and chemistry lab facility upgrades (shelving, plans for pipe re-routing and GC arrangement). Technical cross training continued in the Thin Section, Physical Properties and Chemistry laboratories, and with the DESClogik and RigWatch systems.

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