IODP Expedition 340: Lesser Antilles Volcanism and Landslides

Week 6 Report (9-15 April 2012)

OPERATIONS

Week 6 began while taking Core U1400C-14H from 112 mbsf. Ten out of 21 APC cores in Hole U1400C were partial strokes and we advanced the hole by recovery. After reaching APC refusal on Core U1400C-22H, we switched to XCB coring which extended to 436 mbsf (Core U1400C-49X). Twenty-one APC cores were taken over a 176-meter interval and recovered 180 m (102%). Twenty-seven XCB cores were taken over a 245-meter interval and recovered 124 m (51%). Overall core recovery for Hole U1400C was 72%. After we finished coring, we conditioned Hole U1400C for wireline logging with a 25-barrel high viscosity mud sweep and displaced it with 201 barrels of 10.5 ppg mud.

While attempting to raise the drill bit up to logging depth, the drill string started to experience overpull between 400 and 320 mbsf. By the time the bit had reached 318 mbsf, upwards motion of the drill string became impossible. For nearly 17 hours, we attempted to back ream (rotate and circulate) the BHA (bottom hole assembly) upwards. At 0045 h on 12 April, we lost rotation, but not circulation. After trying in vain to free the stuck pipe, we started to rig up the charges to severe the drill string. At 0945 h, the first severing charge was activated at the top of the tapered drill collar, but we were still unable to rotate or raise the drill string. During a second attempt to sever the drill string just below the seafloor, the severing charge did not activate. After fixing a faulty connection in the tool, it was lowered back to just below the seafloor and activated – the drill string was successfully severed and the drill pipe was freed from the formation. The entire BHA (including 2 stands of 5.5 inch drill pipe and 15 joints of 5 inch drill pipe) was lost in Hole U1400C. The remainder of the pipe was tripped to the surface and the severed joint of drill pipe cleared the rig floor at 0730 h on 13 April, ending Hole U1400C and Site U1400. The total time spent on Hole U1400C was 141 hours.

Prior to departing Site U1400, we commanded both acoustic-positioning beacons to release. One of the beacons failed to release and after trying to release the beacon for 40 minutes, it was declared lost. While picking up the new BHA and lowering the drill string to the seafloor, the vessel was moved in dynamic positioning (DP) mode 7 nmi to the next site, Site U1401 (CARI-12A).

We arrived at Site U1401 at 1200 h on 13 April while still tripping drill pipe to bottom. We paused lowering the drill string to install the subsea camera system, which was lowered to the bottom as the pipe trip continued. At 1610 h, using the subsea camera, we tagged the seafloor at 2609 mbrf. After dropping an acoustic-positioning beacon, we conducted a seafloor 40-meter box survey to make sure that the area was suitable for

spudding Hole U1401A. After spacing out the bit to 1 m above the seafloor, Hole U1401A was spudded at 1950 h on 13 April. APC coring continued through Core U1401A-4H - every core was a partial APC stroke, including the mud line core. Because the mud line core was a partial stroke with an 8 meter recovery, the official water depth assigned to Hole U1401A is 2609 mbrf. We switched to XCB coring and Cores U1401A-5X through 11X extended to 82 mbsf. Hole conditions were abysmal during the entire XCB section of the hole and core recovery was also poor. We decided to terminate Hole U1401A at 82 mbsf, before the BHA became stuck in the formation. Four piston cores extended from 0 to 14 mbsf and recovered 14 m (101%). Seven XCB cores were taken over a 67 m-interval and recovered 1.16 m (2%). Overall core recovery for Hole U1401A is 19%. Hole U1401A took 30.75 hours to complete. Given the very difficult coring conditions and short amount of time remaining in the expedition, we decided to APC core a transect of shallow-penetrating holes along the Aguadomar seismic line crossing Site U1401. We offset the ship 300 m in a direction of 242° from Hole U1401A and deployed another seafloor beacon at the location of Hole U1401B.

After determining a new PDR (precision depth recording) depth for spacing out the drill string, the seafloor was tagged to verify this measurement of water depth (2618 mbrf). The bit was then raised 1 meter above the seafloor (to try to prevent another broken or bent core barrel) and Hole U1401B was spudded at 1620 h on 14 April. After 3 partial-stroke APC cores, Hole U1401B was terminated and the bit was pulled out of the hole and cleared the seafloor at 1940 h ending Hole U1401B. The total depth of Hole U1401B was 13 meters and recovered 12 m (96%). Hole U1401B took 5.5 hours to complete.

We then offset the ship again – this time 600 m at a direction of 062° from Hole U1401B. A new PDR seafloor depth was taken for spacing out the drill string and the seafloor was then tagged to verify water depth (2591 mbrf). The bit was then raised 1 meter above the seafloor and Hole U1401C was spudded at 2130 h on 14 April. After 3 partial-stroke APC cores, Hole U1401C was terminated and the bit was pulled out of the hole and cleared the seafloor at 2355 h ending Hole U1401C. The total depth of Hole U1401C was 10 meters and recovered 10 m (100%). Hole U1401C took 4.25 hours to complete.

We then moved the ship 900 m at a direction of 242° from Hole U1401C. A new PDR seafloor depth was taken for spacing out the drill string and the seafloor was tagged to verify water depth. The bit was then raised 1 meter above the sea floor. Despite manually tagging the seafloor and taking a new PDR reading, the first mud line core attempt came up empty. On the second attempt, Hole U1401D was spudded at 0305 h on 15 April. The water depth was calculated to be 2630 mbrf. Because operational time had expired, Hole U1401D was terminated after this one, full-stroke mud line core. The drill string was then pulled back to the rig floor, the drill pipe was secured in the pipe racker, and the BHA was disassembled and put away in the drill collar racks. The rig floor was secured at 1230 h on 15 April, ending Hole U1401D and Site U1401. The total depth of Hole U1401D

was 9 meters and recovered 9 m (100%). Hole U1401D took 12.5 hours to complete.

After securing the rig floor, the thrusters and hydrophone systems were secured and the vessel began the transit to Curacao at 1240 h. At the end of week 6, the vessel was 325.0 miles from Curacao and making a speed of ~13 nmi/hr. Our ETA for Curacao is currently 0800 on 17 April.

SCIENCE RESULTS

Week 6 started in the middle of our coring operations on Hole U1400C (CARI-07C) and ended on Hole U1401D (CARI-12A) with the last core of our expedition. Site U1400 was dedicated to the characterization of debris avalanche emplacement and associated erosional processes offshore Martinique most likely produced by multiple major flank collapses of Montagne Pelée Volcano. With Hole U1400C reaching to 436 mbsf, we managed to retrieve material with which we are going to be able to study all of the main objectives we have for this site. We sampled an entire sequence of the chaotic deposits at this site, the transition zone between these chaotic deposits and the normally bedded marine sediments, and the normally bedded marine sediments themselves. Generally, we recovered alternating sequences of hemipelagic sediments with numerous interbedded tephra layers and turbidites consisting of mainly volcaniclastic material. Overall, almost the entire sequence of sediments retrieved at this site shows signs of intense deformation with steeply inclined bedding of the sedimentary layers and steeply inclined contacts. The material at the base of Hole U1400C consists of highly consolidated hemipelagic normally bedded mudstone; indicating that we reached the desired transition zone between the chaotic deposits and the underlying undeformed marine sediments.

Site 1401 (CARI-12A) was also dedicated to the characterization of the emplacement processes being related to debris avalanche deposition offshore Montagne Pelée Volcano. Site U1401 is 7 nmi closer to the island of Martinique than Site U1400. It was planned to penetrate two different depositional sequences (deposit 3 and deposit 2) to characterize the boundary between those deposits and identify erosive processes and/or frictional interactions between them. We also hoped to core sediments at the top of the avalanche deposit to better constrain the age of the event. The uppermost 15 m of material of the formation cored at Hole U1401A consisted of deformed, hemipelagic sediments with numerous intercalated tephra layers overlying clastic material consisting of andesitic lava fragments of variable size (up to 7 cm in size). Unfortunately, we could not fully reach the objectives planned for this site due to the severely unfavourable drilling conditions encountered caused by the predominantly coarse, unconsolidated nature of the cored formation. Instead of drilling a single hole to 350 mbsf, as planned, we cored multiple short cores along the Aguadomar Seismic Line to trace the evolution of the deformed sediments encountered at the uppermost ~15 m of the formation.

EDUCATION AND OUTREACH

Our education and outreach activities during the sixth week continued with eight live videoconferences, blogging, and daily postings on Facebook and Twitter. Video conferences where held with K-12 students and teachers in schools in Ermelo (South Africa), New Jersey and California; and college students at University of South Florida (Tampa and St. Petersburg, Florida) and Colorado State University in Fort Collins, Colorado. Co-chief Scientist Anne Le Friant participated in an IODP France meeting by broadcasting live from the JR for conference attendees. We regret that due to technical difficulties with internet communications on April 12 we were unable to complete our final broadcast with students and teachers at a primary school in Marseille, France that has been following Co-chief Scientist Anne Le Friant throughout the expedition via her blog and bi-weekly Skype broadcasts. Besides our Education officer Teresa Greely, a number of expedition scientists and technical staff participated in the videoconferences, including, Michael Martinez, Jurie Kotze, Thomas Gorgas, Martin Jutzeler, Andrew Fraass and Nicole Stroncik.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Science Mission Support:

Technical staff remains fully engaged in providing support for coring operations, preparing off-going shipments, and completing end of expedition reports.

Other Technical Activities:

None

HSE Activities:

The weekly fire and abandon ship drill was held as scheduled.