IODP Expedition 340: Lesser Antilles Volcanism and Landslides

Week 3 Report (19-25 March 2012)

OPERATIONS

Week 3 of Lesser Antilles Volcanism and Landslides Expedition (340) began with an uneventful pipe trip to spud Hole U1397A. The bit was initially set at 2484.5 mbrf and the hole was spudded at 0422 h (UTC-4h) on 19 March. The first 9 cores were oriented with the FLEXIT tool. Non-magnetic core barrels were used for APC coring from Core U1397A-1H through -17H. APCT-3 temperature measurements were taken on Cores U1397A-5H through -7H. An APCT-3 core was attempted on Core U1397A-3H, but the electronics failed and data could not be downloaded. The majority of the piston cores were incomplete strokes and the hole was advanced by recovery. After reaching APC refusal, XCB coring continued to 265.5 mbsf. Because of time constraints, coring was terminated after Core U1397A-35X at 265.5 mbsf - shallower than the target depth of 314 mbsf. Difficult hole conditions contributed to increasing the coring time required to advance the hole. Overall core recovery for Hole U1397A was 55%. After the completion of coring, the drill string was pulled back with the top drive still installed. The bit cleared the seafloor at 0055 h on 21 March ending Hole U1397A. The total time spent on Hole U1397A was 53.25 h.

After clearing the seafloor from Hole U1397A, the vessel was offset 20 meters to the east and Hole U1397B was spudded at 0252 h on 21 March. Non-magnetic core barrels were used on all cores. APCT-3 temperature measurements were taken on Cores U1397B-3H, -4H, and -7H. Similarly to Hole U1397A, most of the piston cores were partial strokes and the hole was advanced by recovery. After reaching APC refusal on Core U1397B-17H, XCB coring continued to 265.5 mbsf. Because of time constraints, coring was terminated after Core U1397A-33X at 253.5 mbsf - short of the 314 mbsf target depth. Difficult hole conditions contributed to increasing the coring time required to advance the hole. Overall core recovery for Hole U1397B was 53%.

At the conclusion of coring, Hole U1397B was conditioned with a 30-barrel high viscosity mud sweep. Hole conditions at the end of coring were very bad and the top drive had to be left in to pull upward. Both rotation and circulation were required until ~220 mbsf. The hole was not displaced with logging mud since the mud would have simply pumped away during the circulation required to keep the drill string free. The drill string was then pulled up to 2645 mbrf, the wireline rigged up for logging, and the triple combo was deployed. Because of the poor hole conditions, the two nuclear sources typically used in this logging string were not included. Two successful passes were made to 221.1 mbsf. The tool string was then pulled back to surface and rigged down. The FMS-sonic tool string was then picked up and the tool was run to 210.3 mbsf. Two passes

were made over the length of the open hole. The second pass was only able to reach ~205 mbsf as the hole slowly deteriorated. The tools were then pulled back to surface and rigged down. At the beginning of the last logging run, the driller noted a drill string overpull of 70 klbs. After the FMS-sonic was recovered, the top drive was picked up and using rotation and overpull the drill string was worked free from the formation. The bit cleared the rotary table at 0240 h and the drill floor was secured at 0245 h on 24 March ending Hole U1397B and Site U1397 (CARI-010B). The total time spent on Hole U1397B was 73.75 h. The vessel then proceeded to Site U1398 (CARI-09B).

After a 46.0 nmi transit from Site U1397 (CARI-09B), the vessel arrived at Site U1398 (CARI-09B). The vessel stabilized over Site U1398 (CARI-09B) at 0706 h on 24 March and Hole U1398A was spudded at 1551 h on 24 March. Core orientation was performed with the FLEXIT tool and non-magnetic core barrels used through Core U1398A-6H. On the third core, the APC system was unable to penetrate the formation so the XCB system was deployed for Cores U1398A-3X and -4X. The APC system was then redeployed on Core U1398A-5H. APCT-3 temperature measurements were taken on Cores U1398A-5H and -6H. Once again, the hole was advanced by recovery after partial APC strokes. Week 3 ended on Core U1398A-27X.

SCIENCE RESULTS

We started our third week with coring operations off Martinique at Site U1397 (CARI-10B) and at the end of the week we are in the middle of our coring operations on Site U1398 (CARI-09B).

Site U1397 (14°54.41'N, 61°25.35'W), located west of Martinique, was chosen to characterize the eruptive history of this volcanic island in space and time. Previous studies on short piston cores (7 m long) have revealed a large number of tephra layers within the marine sediment and shown that the sedimentation rate in this area is about 20 cm/ky. Taking into consideration the proposed total depth at this site the sediments recovered would span a time interval of about 1 Ma. It was also expected to be able to identify and date layers related to the emplacement of debris avalanches from Montagne Pelée and Pitons du Carbet volcanoes as well as to sample the region related to the transition of volcanism from the Pitons du Carbet and Mont Conil volcanoes to the Montagne Pelée from the retrieved material. The end of their volcanic activity (~0.3-0.5 Ma) preceedes, or is synchronous with, the beginning of the Montagne Pelée activity. This site was also thought to contain tephra from volcanoes of Dominica, which can be distinguished from Martinique lavas based on their geochemistry and micro-textural characteristics. Even though we did not reach our depth objectives for this site the retrieved material will allow us to study the eruptional and depositional history of Martinique extending back to ~350 ka. A distinct volcanic marker as well as the bio- and

magnetostratigraphy assign the base reached at this site to an age of 350 to 400 ka. Generally, the material retrieved consist, similar to the other sites cored so far, of hemipelagic muds, volcaniclastic or mixed (bioclastic-volcaniclastic) turbidites, and tephra layers of variable thickness. The amount of hemipelagic background sediment retrieved at this site is lower compared to the other sites. The degree of lithification increases with depth, and at the base of both holes the retrieved sediments are semi-consolidated. The mainly normally graded volcaniclastic turbidites consist of fresh as well as altered andesitic lava clasts, pumice, and crystals. The non-volcanic components observed in some of the turbidite units are composed of biogenic and detrital carbonate. In the uppermost 28 m at this site we cored around 200 tephra layers, followed by more but not quite as abundant tephra layers going deeper into the formation. The tephra layers consist of ash and pumice of variable grain size and are highly variable in thickness.

So far at Site U1398, we recovered similar material as at Site U1397. The sediments recovered from this site will be used to characterize the sedimentation processes (distinguishing between the processes related to volcanic and non-volcanic activity) in the backarc Grenada Basin. We plan to retrieve a complete sedimentation record down to ~264 mbsf at this site. The material recovered so far consists of tephra layers (being less frequent than at the last site, Site U1397) and volcaniclastic turbidites intercalated with hemipelagic background sedimentation. The proportion of hemipelagic sediment is larger at this site compared to Site U1397.

EDUCATION AND OUTREACH

Live videoconferences continued during the third week of our expedition. On Monday we had live broadcasts with students from the Brockenhurst College (Hampshire, UK) and from the Don Callejon Middle School (Santa Clara California, US) featuring scientists Martin Palmer and Martin Jutzeler. On Tuesday, scientists Martin Palmer and Anne Le Friant hosted a live broadcast with students from the Abbotswood Jr School (Hampshire, UK; ages 8-11 years), and the College Eugene Yssap (Sainte Anne, Guadeloupe; ages 13-16 years). On Thursday our education and outreach activities continued with a live video conference with the Primary School Marseille (Aoz-en-Provence, France) featuring our co-chief scientist Anne Le Friant and another one with the Fairlands Elementary (Pleasanton California, US) featuring our staff scientist Nicole Stroncik. On Friday we continued our broadcasts with the Admiral Farragut Academy (St. Petersburg, FL) and the University of Leicester (Leicester, UK) featuring our education and outreach officer Teresa Greely as well as one of our logging staff scientists, Sally Morgan. In addition blogging with our scientists continued over the entire week.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Science Mission Support:

Technical staff remains fully engaged in providing support for coring operations.

Other Technical Activities:

- NGR data reduction: While logging, full background as well as an edge correction test was conducted. Analysis of data is in progress.
- Cold Lab ceiling lights installed and work is proceeding on the ceiling installation.
- Numerous data management and processing issues encountered and corrected.

HSE Activities:

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