

IODP Expedition 340: Lesser Antilles Volcanism and Landslides

Week 4 Report (26 March – 1 April 2012)

OPERATIONS

Week 4 began with continued XCB coring. After recovering Cores U1398A-28X through -30X, coring in Hole U1398A was terminated at 268.6 mbsf after the depth objective was met. A total of 11 APC cores were taken over an 86.3-m interval and recovered 86.98 m. A total of 19 XCB cores were taken over a 182.3-m interval and recovered only 28.11 m (15%). Overall core recovery percentage for Hole U1398A was 43%. After the completion of XCB coring, the drill string was pulled back, the top drive set back and the bit cleared the seafloor at 0540 hours on 26 March ending Hole U1398A. The total time spent on Hole U1398A was 46.75 hours.

After clearing the seafloor, the vessel was offset 20 meters east and Hole U1398B was spudded at 0723 hours on 26 March. The seafloor depth was calculated from the length of the first core to be 2946.6 mbrf (2935.1 mbsf). APC cores were oriented and non-magnetic core barrels were used up to Core U1398B-11H. APCT-3 temperature measurements were taken on Cores U1398B-4H, -8H, and -10H. Similarly to Hole U1398A, most of the piston cores were partial strokes and the hole was advanced by recovery. After reaching refusal on the APC system on Core U1398B-24H, the XCB core system was deployed and XCB coring continued to 263.4 mbsf. Coring was terminated after Core U1398B-34X. A total of 24 APC cores were taken over a 170.7-m interval and recovered 172.11 m (101% recovery). A total of 10 XCB cores were taken over a 92.7-m interval and recovered 14.64 m (16% recovery). Overall core recovery percentage for Hole U1398B was 71%.

After the conclusion of coring, Hole U1398B was conditioned with a 25-barrel high viscosity mud sweep, displaced with 133 barrels of 10.5 ppg mud, and a go devil was pumped to prepare for downhole logging. The drill string was then pulled back to 3016 mbrf, the top drive was set back, knobbies were added to the drill string, the bit was set at 84.91 mbsf, and the pipe was hung from the blocks. After rigging up for logging, the triple combo tool string was deployed. While running in the hole with the triple combo tools the drill string became stuck. The tool string was then pulled back to surface and rigged down. The top drive was picked up, rotation and circulation were re-established and the hole was worked vertically until all overpull was eliminated. At this point, because of the known poor hole conditions, the nuclear sources were removed from the triple combo logging string. The triple combo string was then redeployed, but was unable to completely pass through the BHA. After trying unsuccessfully to lower the string, the string was pulled back. At one point the logging tools became stuck and couldn't be moved up or down. After freeing the logging string, the tools were then pulled back to

surface and rigged down. After laying out the triple combo tool string, the top drive was picked up and rotation, circulation, and overpull was needed to free the drill string from the formation. We decided not to make further attempts to log this hole. The knobbies were laid out, the top drive was set back, the drill string was pulled out of the hole, and the bit raised to 2800 mbrf. The knobbies were then reinstalled, the drill floor was secured, and the acoustic beacon was recovered at 1420 hours. At 1430 hours on 28 March, all activities at Site U1398 were completed and the vessel moved to Site U1399 (CARI-08B) in dynamic positioning mode at 1.5 knots. The total time spent on Hole U1398B was 56.75 hours.

The vessel stabilized over Hole U1399A (CARI-08B) with the drill string already deployed to 2800 mbrf. The knobbies, which had been installed for the DP move, were removed from the drill string. The drill string was then tripped to just above the seafloor. The precision depth recorder (PDR) was then used to approximate the seafloor depth and the top drive was picked up and the drill string spaced out to 2908 mbrf. Hole U1399A was spudded at 0145 hours on 29 March. The seafloor depth was calculated from the length of the first core (5.1 m) to be 2911.8 mbrf (2900.2 mbsf). APC coring extended to 207.5 mbsf (Core U1399A-29H). APC core orientation was performed and non-magnetic core barrels were used up to Core U1399A-12H. APCT-3 temperature measurements were taken on Cores U1399A-3H, -4H, -5H, and -6H. APC coring was difficult over the entire 207.5-m interval. A total of 16 partial strokes were recorded and 3 cores had to be drilled over to release them from the formation. After reaching refusal on the APC system on Core U1399A-29H, XCB coring continued to 274.7 mbsf. Coring was terminated after Core U1399A-36X. A total of 29 APC cores were taken over a 207.5-m interval and recovered 210.45 m (101%). A total of 7 XCB cores were taken over a 67.2-m interval and recovered 9.43 m (14%) of recovery. Overall core recovery for Hole U1399A was 80%.

The drill string was pulled clear of the seafloor at 2115 hours on 30 March, ending Hole U1399A. The vessel was then offset approximately 350 meters to the northeast while maintaining position with the acoustic beacon initially deployed on Site U1399. Because of the fairly large offset from Hole U1399A, a new seafloor depth was obtained from the PDR for Hole U1399B.

After picking up the top drive and spacing out the drill string to 2908 mbrf, Hole U1399B was spudded at 2315 hours on 30 March. The seafloor depth was calculated from the length of the first core to be 2911.8 mbrf (2900.2 mbsf). APC core orientation was performed, and non-magnetic core barrels were used, up to Core U1399B-14H. APCT-3 temperature measurements were taken on Cores U1398B-3H, -6H, and -9H. Similarly to Hole U1399A, most of the piston cores were partial strokes. The hole was advanced by recovery. The drill string became stuck after Core U1399B-27H while running in and trying to land the next core barrel. After the drill string was freed, the bit was pulled back

a single joint of drill pipe at a time until good rotation and torque were re-established. While drilling back to the bottom of Hole U1399B, fill was encountered 15 m above the total depth of Hole U1399B. After trying unsuccessfully for over 4 hours to re-establish conditions suitable for coring, a decision was made to abandon Hole U1399B. Coring was terminated after Core U1399B-27H. A total of 26 APC cores were taken over a 180.5-m interval and recovered 183.04 m (101%). In addition, there was one drilled interval of 2.5 m. The final depth for Hole U1399B was 183.5 mbsf. After pulling clear of the seafloor, the vessel was re-positioned 50 meters from Hole U1399A at a direction of 050°.

After discussions with science and operations staff, the decision was made to drill a dedicated logging hole. After spacing out and dropping an XCB core barrel, Hole U1399C was spudded at 1115 hours on 1 April. The seafloor depth for U1399C was recorded as 2912.4 mbrf (2900.2 mbsf). At midnight on 1 April, Hole U1399C had been advanced to 221.59 mbsf with a target depth of 240 mbsf.

SCIENCE RESULTS

We started our fourth week in the middle of our coring operations on Site U1398 (CARI-09B) and ended it with preparation for our logging operations on Site U1399 (CARI-08B) west of Martinique.

Site U1398 was chosen to characterize the sedimentation processes in the back-arc Grenada Basin, to identify the turbiditic sequences related primarily to debris avalanche deposition versus those related to non-volcanic processes. We also expect to improve the reconstruction of the post collapse eruptive activity and test whether more extensive pyroclastic units (ignimbrites) are associated with the post-collapse dacitic lava domes of Pitons du Carbet. This will provide better constraints on the transition of activity between the Pitons du Carbet and the Montagne Pelée volcanoes. Finally, we expect to sample turbidites with volcanic material coming from Dominica (e.g., Roseau tuff). It was planned to recover a complete sedimentation record including hemipelagic sediments as well as turbidites in the 264 m penetration holes cored at this site.

Two holes were cored at Site U1398. We not only reached our depth objectives (269 and 263 mbsf) but obtained material that will allow us to study the main objectives at this site. Generally, both holes are composed of alternating sequences of thick, massive, mainly normally graded volcanoclastic turbidites divided by relatively thin layers of hemipelagic sediment and hemipelagic mud interbedded with multiple thin tephra and turbiditic layers. Pumice clasts are ubiquitously present throughout both holes. The differences in the characteristics of the sampled turbidites are highly indicative of differences in the emplacement processes of these sequences.

This week we also started coring and logging operations at Site U1399. Site U1399 was designed to characterize the processes accompanying debris avalanche emplacement and associated erosional processes. In detail, we hoped to be able to characterize and quantify the erosional processes of the upper sedimentary layers deposited in the Grenada Basin associated with debris avalanches and their subsequent incorporation into the debris flow. The seismic and bathymetric survey for Site U1399 revealed that this site is located on one of the main debris avalanche deposits and that coring at this site will most likely retrieve volcanic and biogenic sediments with intercalated, large, chaotic debris avalanche deposits of the so called debris avalanche deposit 1.

As with the previous site we reached our depth objectives at Site U1399 (at least in one hole) and retrieved material that will allow us to address the main objectives of this site. Generally, both holes at Site U1399 are composed of turbiditic sequences and tephra layers interbedded with hemipelagic sediments. The thickness of the turbidite and tephra layers is variable and grain size varies throughout the cored volcanoclastic sequences. At the base of Hole U1399A, lithified hemipelagic sediments were recovered. In contrast to our previous sites, the sediments retrieved at this site show signs of intense deformation throughout the entire cored interval, except for the basal un-deformed layers of lithified hemipelagic sediment. This clearly indicates that we achieved the main coring objective of this site – to retrieve an entire sequence of the chaotic deposit and the transition zone between the chaotic deposit and the normal marine sediments as well as the upper part of the normally-bedded marine sediments.

EDUCATION AND OUTREACH

Our education and outreach activities during the fourth week continued with six live videoconferences, blogging, and daily postings on Facebook and Twitter. Also an Expedition 340 Science Party and Crew Member Info Update form for the website was distributed on board. The daily blogs contained general science information, weekly summaries of findings, life at sea and JR operations. Videoconferences were held with schools, colleges and aquariums in Texas and Florida. A number of expedition scientists and technicians participated in the videoconferences, including Chieh Peng, Maggie Hastedt, Gemma Barrett, Heather Barnes, Carrie Miller, Martin Jutzeler, Konduri Subramanyam, Osamu Ishizuka and Andy Fraass.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Science Mission Support:

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

Other Technical Activities:

- Cold Lab ceiling installation completed.

HSE Activities:

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