

IODP Expedition 340: Lesser Antilles Volcanism and Landslides

Week 1 Report (3-11 March 2012)

OPERATIONS

Week 1 of Expedition 340 began while sitting alongside the Navy Frontier Pier in San Juan, Puerto Rico. The vessel was secured for sea with final maintenance checks performed prior to departure. Last line was released from shore at 08:48 beginning the passage to Site U1393 (CARI-02C). After a 347 nautical mile transit from San Juan, Puerto Rico to Site U1393 (CARI-02C), which included an unplanned diversion to a rendezvous point, just off the coast of Antigua, to pick up a Siem Offshore crew member, the vessel arrived at the first expedition location, Site U1393 (CARI-02C). The vessel stabilized over Site U1393 (CARI-02C) at 18:00 on 6 March.

The BHA was picked up and drifted, followed by running drill pipe to bottom. Prior to starting coring operations a seafloor survey was conducted to locate favorable locations to spud possible holes at the site. A clockwise spiral on a 20-m center was conducted. The survey identified a large megablock to the southeast of the preliminary location and our first hole was adjusted to 20 m west of the original location. A single hole was then cored at this site to a depth of 47.55 mbsf with an 11 ⁷/₁₆" diameter APC/XCB core bit and a 135.75 m long BHA. A mud line core with the APC system established a water depth of 926 mbsl. The second APC core bounced off the formation and the APC system was changed over to the XCB coring system. Coring conditions proved to be very difficult and recovery was very poor. Coring was terminated at 05:15 on 8 March when the XCB system failed, leaving part of the XCB core barrel in the hole. The remainder of the XCB system was retrieved by wireline. The drill string was then pulled clear of the seafloor, the top drive was set back and the drill string was tripped to surface while the vessel began its 5.3 nm transit to Site U1394 (CARI-03C). At 10:25 on 8 March the bit cleared the rotary table ending Hole U1393A. Overall core recovery for Site U1393 was 11.4% of the 47.5 m cored. Core recovery for the two APC cores was 4.36 meters for the 4.4 m advance. An additional 5 XCB cores were attempted over a depth of 43.1 m with only 1.05 m of core recovered. Most of the recovery consisted of small diameter pieces of volcanic debris. Two holes were originally planned for this site, but because of the poor drilling conditions, the second hole was cancelled.

After inspecting the APC/XCB BHA for damage, 6 additional drill collars were picked up and the BHA and drill pipe were tripped into the hole. The vessel arrived at Site U1394 (CARI-03C) and was in position at 12:30. Because a subsea communications cable had been run in the general area of operations a camera survey was performed to make certain that our operations would not impact the cable. At 16:30 the bottom survey began at the preliminary site coordinates. A 40 m square survey was conducted with no

signs of a subsea cable. The seafloor was tagged twice during the survey to establish depth from the drill floor. Tagged depth at both locations was 1126.6 mbrf. After the survey was completed, the VIT was removed, the top drive was picked up and the bit was spaced out to spud Hole U1394A. Hole U1394 A was spudded at 19:45 on 8 March. The seafloor depth was calculated from the length of the first core to be 1126.3 mbrf. APC refusal on Hole U1394A came on the fourth piston core at a depth of 23.9 mbsf. The XCB system was then deployed and coring continued through Core U1394A-27X without problems, but with generally poor recovery.

Just after midnight on 10 March while retrieving XCB Core U1394A-28X, the wireline overshot detached from the XCB barrel. The sinker bar assembly was pulled to the surface, drill string connection opened and wireline sinker bar assembly inspected to determine where the overshot assembly parted. Two unsuccessful attempts were made to retrieve the lost core barrel. When the mud pumps were engaged again after tightening the pipe connection, the drill string was packed off and bled off. Shortly thereafter drill string rotation was lost. Attempts were made to regain rotation and circulation for ~3.5 hours, and the decision was made to call out the Schlumberger Engineer to begin preparations to sever the drill string just below the upper connection on the tapered drill collar (TDC).

While the Schlumberger Wireline engineer made the necessary checks of the severing equipment, a Bowen wireline fishing overshot was deployed in two unsuccessful attempts to grab the overshot outer body. The drill string was severed at 14:20 on 10 March at ~1240 mbrf, just below the upper connection of the TDC. All of the BHA components below the 5.5" transition pipe were left in the hole along with the XCB core barrel and Core U1394A-28X.

Schlumberger severing equipment was then rigged down and the wireline pulled back to surface. The remainder of the drill string was tripped to the surface and the severed end of the TDC cleared the rotary table at 18:45 hours on 10 March.

A new bit and BHA were then picked up, drifted, measured and deployed for Hole U1394B. At midnight on 10 March drill pipe was being run into the hole at a depth of 126 mbrf.

SCIENCE RESULTS

The aim of IODP Expedition 340 is to understand the constructive and destructive processes related to volcanism along island arcs. Processes occurring along these arcs are among the most fundamental ones occurring on our Earth, as roughly 50% of volcanism along the circum-Pacific ring of fire is associated with island arcs. Nonetheless, several aspects of this type of volcanism, such as the processes controlling the changes and the diversity in magmatism and eruptive activity on individual islands as well as along an arc

or the emplacement processes of large debris avalanches, are not well constrained. The identification of the controlling mechanisms of these processes is essential because of their potential association with large geohazards (explosive eruptions, tsunamis). Generally, the cores and logging data retrieved during this expedition will be used to investigate the magmatic evolution and the eruptive activity in space and time along the Lesser Antilles Arc as well as on the identification of the mechanisms controlling triggering, transport, and deposition of volcanic debris avalanches, including an assessment of volcanic hazards being potentially coupled with the eruptive processes and debris avalanche emplacement.

The scientific party arrived on board the *JOIDES Resolution* on 3 March. They spent the first three days of the expedition familiarizing themselves with the laboratories, instrumentation, documenting methods, and practicing core flow and sampling procedures. They also received a comprehensive training on DESClogik, the application for entering descriptive data into the database. The respective templates for the descriptive groups have also been finalized during this period. In addition, shipboard sampling strategies and core flow were discussed. By the end of this week, all groups submitted their first draft of the “Methods” chapter (explanatory notes) for the Expedition Reports. A coordinated shipboard sampling plan was developed and agreed upon. All personal sampling, except for microbiology, pore water and geotechnical testing, will happen during a postcruise sampling party in College Station, Texas.

During this week we started and finished coring operations at Site U1393 (CARI-2C), started and finished coring operations in Hole U1394 (CARI-3C) and started coring operations in Hole U1394B. Site U1393 was designed to retrieve as much material as possible of the youngest debris avalanche deposit (deposit 1) created by the Soufrière-Hills volcano on Montserrat. Drilling in this unconsolidated, heterogeneous, chaotic material was extremely difficult and we only retrieved a total of 5.42 m of material. The bottom depth at this site is 48 mbsf. The upper ~4 m of material retrieved at Site U1393 consist of mud clasts being distributed in a sandy matrix followed by a mixture of dark brownish gray-black volcanoclastic sand with medium to very coarse sand-sized grains of andesitic lava and carbonate material. Below this only cut up pieces of andesite, sometimes hydrothermally altered or oxidized, were occasionally retrieved within the core catcher. Site U1394 was designed to core the distal parts of an older debris avalanche deposit (deposit 2) of the Soufrière-Hills volcano on Montserrat and to reach the interface between the base of the debris deposit and the underlying sediment. We recovered a total of 57 m of material with an average recovery rate of 23% from Hole U1394A. The total depth reached into the formation was 254 mbsf. As planned, we reached the interface region between the debris avalanche deposits and the underlying marine sediment but also recovered material of an even older debris avalanche deposit below it. The upper parts of the recovered material consist of volcanoclastic sediments

followed by a mix of volcano clastic and biogenic sediments, followed by turbidites composed of volcanic material with basaltic fall out deposits at the base. Below this package material of the debris avalanche deposit was retrieved. Beneath these deposits mainly hemiplegic sediments have been cored. From the base of this hole we retrieved andesitic fragments of an older debris avalanche deposit.

EDUCATION AND OUTREACH

The expedition education officer has already been very active. After giving the scientists a presentation on the general program she started blogging and posting pictures. We also had the first live ship to shore videoconferences with different groups during this last week.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Science Mission Support: Technical staff completed crossover and port call logistics activities in San Juan, Puerto Rico. The Science Party members were introduced to their laboratories, met technical staff, and trained on data systems and instrument host software. Upon arrival at our first site, the technical staff has been fully engaged in providing full support for coring operations and preparing seismic equipment for a possible vertical seismic operation.

Other Technical Activities:

- Work continues on the Cold Laboratory ceiling after parts arrived in port call.
- The remaining fancoils have been installed in the Core Storage Area and electrical wiring started for power and control started.
- Testing of the laser engraver is in progress.

HSE Activities:

The science party and new technical staff completed Siemens's safety induction and the IODP's Laboratory Safety Tour. The weekly fire and abandon ship drill was held as scheduled.