IODP Expedition 340: Lesser Antilles Volcanism and Landslides

Week 2 Report (12-18 March 2012)

OPERATIONS

Week 2 of Expedition 340 began while running pipe into Hole U1394B. The vessel was offset 20 m north of Hole U1394A and the hole was spudded at 02:55 on 11 March. At Core U1394B-2H recovered only 6.4 m and the XCB coring system was deployed for the next 5 cores. After Core U1394B-7X, the APC system was again picked up and used to complete the hole to a depth 181.4 mbsf on Core U1394B-21H. The entire section was difficult to piston core and seven of the cores had to be drilled over to release them from the formation. A total of 16 piston and 5 XCB cores were taken with an overall core recovery for Hole U1394B of 141.15 m (recovery of 77.8%).

At the conclusion of coring, Hole U1394B was conditioned with a 30-barrel high viscosity mud sweep and displaced with 71 barrels of 10.5 ppg mud for logging. Schlumberger was then rigged up for logging and the triple combo was deployed without the nuclear source. Two successful passes were made to a depth of 179.4 mbsf and the triple combo string was rigged down. The VSI tool was rigged up and run down the drill string. Simultaneously the Protective Species Watch began. After observing all seismic operating procedures, the seismic guns were ramped up in preparation for the VSP experiment. Unfortunately, the VSI tools were unable to pass through the BHA and after 3 hours of trying various means of getting the tools to pass the BHA, the VSI tool string was brought back to surface and the VSP experiment was cancelled. The VSI tool string was rigged down and the FMS-sonic tool string was picked up and run to 180.4 mbsf. Two passes were made over the length of the open hole. The tools were then pulled back to surface and rigged down. At 01:45 the vessel started the 10 nm transit to Site U1395 (CARI-04D).

The vessel arrived at Site U1395 (CARI-04D) at 02:58 and Hole U1395A was spudded at 08:52 on 13 March. Orientation was performed with the FLEXIT tool on the first 9 cores with good results. Non-magnetic core barrels were used for APC coring from Core U1395A-2H through Core U1395A-9H. APC refusal was met on the fifteenth piston core at a depth of 120.8 mbsf. The XCB system was deployed and coring continued through Core U1395A-28X without problems, but with generally poor recovery. A total of 15 piston and 13 XCB cores were retrieved with an overall core recovery of 144.28 m for the 231.3 m interval (recovery of 62.4%).

After clearing the seafloor, the vessel was offset 20 m east and Hole U1395B was spudded at 19:30 on 14 March. Non-magnetic core barrels were used for APC coring from Core U1395B-2H through Core U1395B-10H. APC refusal came on the fifteenth piston core at a depth of 124.1 mbsf. The XCB system was deployed and coring

continued through Core U1395B-25X without problems, but with generally poor recovery. The SET tool was deployed after Core U1395B-17X. While the deployment seemed flawless, a seal within the tool leaked during deployment and no data were recovered from the tool. A total of 15 piston and 10 XCB cores were taken with an overall core recovery for Hole U1395B of 139.54 m for the 203.3 m interval (recovery of 68.6%). At the conclusion of coring, Hole U1395B was conditioned with a 25 barrel high viscosity mud sweep and displaced with 85 barrels of 10.5 ppg mud for logging. The drill string was then pulled back, the top drive was set back, the bit was set at 82.3 mbsf and the pipe was hung from the blocks. Schlumberger was then rigged up for logging and the triple combo was deployed. Two successful passes were made to a depth of 201.3 mbsf. There was some difficulty getting the tool back into the drill string, but after several attempts the tool string entered the drill string and was pulled back to surface and was rigged down. The FMS-sonic tool string was picked up and run to 200.4 mbsf and two passes were made over the length of the open hole. The tools were then pulled back to surface and rigged down. At 20:00 the vessel started the 28.6 nm transit to Site U1396 (CARI-01C).

The vessel stabilized over Site U1396 (CARI-01C) at 22:45. Hole U1396A was spudded at 03:45 hours on 17 March. Orientation was performed with the FLEXIT tool on the first 12 cores with good results. Non-magnetic core barrels were used for APC coring from Core U1396A-1H through Core U1396A-12H. Core U1396A-2H had the liner shatter when the piston was fired. APCT-3 temperature measurements were taken on Cores U1396A-3H through U1396A-6H. A total of 15 piston cores were taken over a 134.9 m interval with a total recovery of 140.51 m of core (104.2%). After the completion of APC coring, the drill string was pulled back with the top drive still installed and the bit cleared the seafloor at 16:15, ending Hole U1396A. After clearing the seafloor the vessel was offset 20 m east and Hole U1396B was spudded at 16:50 on 16 March. The first 5 meters of Hole U1396B were drilled down and Core U1396B-2H was shot from 5 mbsf recovery 10.0 (105.3%). The hole was terminated and the drill string was pulled clear of the seafloor at 17:25. The vessel was offset 20 m south and Hole U1396C was spudded at 18:10 hours. Orientation was performed with the FLEXIT tool on all 15 cores with good results. Non-magnetic core barrels were used on all cores. APCT-3 temperature measurements were taken on Cores U1396A-6H and U1396A-11H. A total of 15 piston cores were taken over a 139.4 m interval with a total recovery of 145.87 m (104.6%). After the completion of APC coring, the top drive was set back and the drill string was pulled back to the rig floor with all equipment secured at 09:35 on 18 March, ending Site U1396. The vessel started its 113 nm transit to Site U1397 (CARI-10B).

SCIENCE RESULTS

During week 2 of this expedition we finished our drilling operations around the island of

Montserrat, with the conclusion of Hole U1394B at the beginning of the week followed by coring two and three holes on Sites U1395 (CARI-04D) and U1396 (CARI-1C), respectively. Sites U1394 and U1395 were designed to study the sedimentary and erosive processes as well as the dynamic processes in the avalanche itself, which occurred during the emplacement of volcanic debris avalanche deposits based on the sequences cored at around the distal (U1394) and frontal (U1395) part of debris avalanche deposit 2 of Soufrière-Hills volcano on Montserrat. Work around the Canary Islands has shown that distal volcaniclastic turbidites generated by collapse events can be used to study the gross character of the initial avalanche emplacement. Results from the ODP Hole 1223A around Hawaii identified the association of several turbiditic deposits associated with landslides, showing that the Koolau Volcano collapsed repeatedly as well as that those landslides constituted a greater risk than previously assessed. In contrast, the main objective of Site U1396 was to characterize the eruptive history of Montserrat back to the early beginnings of this island (~2.6 Ma), based on the marine sediments and tephra layers expected to be cored at this site.

At Site U1394 it was planned to reach the interface between the distal parts of the debris avalanche deposit and the underlying marine sediments, whereas at Site U1395 it was planned to recover the interface region between the distal turbiditic sequences associated with debris avalanche deposition and the marine sediments. At both sites we not only reached our depth objectives, but the cored material will allow us to study all the planned scientific objectives for these sites in detail. Generally, the material retrieved at both sites consists of various combinations of hemipelagic muds, volcaniclastic turbidites of varying grain sizes and muds, and volcanic tephra. The background sediment mainly consists of fine-grained calcareous biogenic fragments and siliciclastic sediment of pale yellowish gray to dark gray color, varying in grain size from fine silt to fine mud. The turbiditic units generally consist of a mixture of volcaniclastic and bioclastic material. Volcaniclasts include fragments of fresh andesitic lava, altered lava, and crystals (feldspar, amphibole, etc.). Bioclasts include fragments of carbonate materials such as corals and shells. The ratio of volcaniclastic to bioclastic components varies throughout the deposits. The tephra deposits sampled at these sites consist of ash, pumice or scoria particles, of varying composition. The thickness of the different tephra layers is variable. Generally, the boundaries between the different lithostratigraphic units are mainly defined by abrupt or gradational changes in the abundance of lithologies or by distinctive marker horizons such as fall out deposits or unusually thick turbidites.

At Site U1396 we recovered a full record of hemipelagic sediments with intercalated tephra layers down to a total depth of 139 mbsf. The hemipelagic sediments consist of a mixture of mainly carbonates and volcaniclastic particles, whereas the tephra layers consists of mainly ash and pumice. Based on the bio-stratigraphic and magneto-stratigraphic studies done on the sampled material the deepest sediments cored at this site

date as far back as 4.5 Ma. Thus, with the large number of tephra layers retrieved within the cores it will be possible for the first time to completely reconstruct the geochemical evolution and the eruptive history of Montserrat, achieving all of the scientific objectives for this site.

EDUCATION AND OUTREACH

Week 2 education and outreach activities were characterized by a number of live video-conferences with different places around the globe, such as France, Germany, Guadeloupe, UK, and the USA. The groups involved in those activities ranged from 5 to 10 year olds of various elementary schools to students at the undergraduate level. In addition many of our scientists are involved in blogging, busy answering questions of the outside world on all the different aspects of our expedition.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Science Mission Support

Technical staff remains fully engaged in providing support for coring operations. In addition, staff rigged and deployed the GI-Gun cluster and maintained a Protected Species watch during a one-day VSP operation. No protected species were sighted and the GI-Gun cluster operated without problems.

Other Technical Activities:

- On our first operational run the SET tool flooded. Upon inspection damaged O-rings were found in the lower probe connection. The electronics package was damaged and will be returned for repairs.
- Investigation in progress on edge effects not being fully corrected with the NGR data reduction process.
- Cold Lab ceiling lights were installed and work is proceeding on the ceiling installation.
- Minor issues with Pycnometer cell #1 were corrected.
- Numerous data management and processing issues encountered and corrected.
- SHIL image correction and cropping module deployed.

HSE Activities:

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