

IODP Expedition 330: Louisville Seamount Trail:

Week 9 Report (7-11 February 2011)

OPERATIONS

After Hole U1377A on Hadar Guyot (Prospectus Site LOUI-4B) needed to be abandoned the vessel was slightly offset and Hole U1377B was spudded on 6 February. Rotary coring advanced the hole to a final depth of 37.0 mbsf with an average recovery of 39% when time on site expired. After the drill string was recovered, and the beacon retrieved, the vessel departed Site U1377 for Auckland at 0730 hr on 8 February. The time on Hole U1377B was 57.5 hours and the total time on site was 70.0 hours (2.9 days). Because of concerns of heavy wind and rough seas on the transit to Auckland, the vessel departed the location approximately 18 hours earlier than originally planned. Despite experiencing strong headwinds during the first half of the voyage (resulting in a drop of transit speed to ~9 knots) the vessel arrived in Auckland on 11 February about 12 hours earlier than originally planned. With the first line ashore at 17:09 Expedition 330 has ended. In total 1114 m of sediment and igneous basement were cored at 8 holes at 6 sites located on 5 different seamounts and 806 m of core was recovered corresponding to 72% recovery.

SCIENCE RESULTS

During the last week of Expedition 330 we finished coring operations on Hadar Guyot and started our transit to Auckland. All laboratory groups described and analyzed the last cores and samples from Site U1377, prepared site reports and cleared their workspaces.

Although limited by a very poor recovery, the material obtained in Holes U1377A and U1377B defines a consistent sedimentary pattern on top of Hadar Guyot. Two units were recognized based on macroscopic and microscopic observations of the sediment. Unit I was recovered at Holes U1377A and U1377B and represents the uppermost sediment of Hadar Guyot. The sediment is composed of a nannofossil foraminiferal ooze, which strongly resembles the soft sediment recovered in the uppermost part of Sites U1372 on Canopus Guyot, U1374 on

Rigil Guyot, and U1375 on Achernar Guyot, and is considered to reflect recent pelagic sedimentation on top of the drilled seamount. The ooze contains a mixed assemblage of calcareous nannofossils and planktonic foraminifers indicating an early Pliocene to Holocene age. Unit II corresponds to few cuttings recovered in Section U1377A-3R-CC, and ten small-sized (<20 cm-thick) pieces recovered from Holes U1377A and U1377B. Unit II includes (1) a middle-late Eocene foraminiferal limestone with abundant planktonic foraminifers, a few ferromanganese encrustations, and rare shallow marine bioclasts (e.g., echinoderm fragments); and (2) a latest Paleocene-early Eocene, heterolithic multicolor basalt conglomerate with a few ferromanganese encrustations. The matrix of the conglomerate is composed of foraminiferal limestone with abundant planktonic foraminifers and a few shallow marine fossils (e.g., echinoderm fragments, larger foraminifera, shell fragments, and gastropods). Preliminary age assignments of the foraminifer content of the limestone (based on thin section observations) range from middle to late Eocene for Hole U1377A and late Paleocene-early Eocene for Hole U1377B. The faunal assemblages and sedimentary textures indicate that Unit II at Site U1377 represents a (or several) condensed section(s) likely to have deposited in a shallow marine to hemipelagic-pelagic environment on top of Hadar Guyot.

Below the sedimentary Units I and II, igneous basement was encountered at 9.1 mbsf in Hole U1377B and a total of 27.9 m of igneous rocks were cored. The upper part of the succession consists of a single, 10.1 m thick unit of flow-banded trachybasalt similar to that in Hole U1377A, whereas the lower part consists of 17 small (up to 2.1 m thick) trachybasalt units with curved and glassy margins. These suggest that this lower part of the succession is composed of pillow lava or small lobate flows erupted in a submarine environment. The upper 3.8 m interval of this lower group contains small amounts of olivine, plagioclase and augite phenocrysts, sometimes in glomerophytic clusters, while the lower part is aphyric. A curious feature of this interval is that, in several instances, the inter-pillow space is filled with glass that connects with the more massive interior of the unit below. It appears that lava in the still molten interior of a pillow has broken out as a protrusion that filled the space between overlying pillows.

Alternatively, magma may have been injected into a stack of pillows, but the similarity in appearance between injected and pillow trachybasalt suggests that, in either case, both were part of the same eruptive event. The strong flow banding seen in both holes suggests that the rocks recovered at Site U1377 are generally alkalic and have probably the most evolved composition of all the rocks drilled during Expedition 330.

The structural geologists found a single geopetal structure in rocks from Hole U1377B indicating that this part of Hadar seamount experienced no tilting after deposition. Veins, vein networks, and vesicle bands are present in both holes, while chilled contacts were only observed in Hole U1377B. Vesicle bands in Hole U1377A have either moderate or sub-horizontal dips. Vesicle bands and chilled contacts in Hole U1377B are moderate to steep, with dips ranging from 45 to 90°. In Hole U1377B glass occurs on chilled pillow margins, along the edge of a small intrusion, and in the matrix of a breccia. These last two glass occurrences indicate forceful intrusion and rapid cooling of new magma into already solidified rocks.

Due to time constraints at the end of this expedition only a single sample could be analyzed geochemically from Site U1377. Its basaltic trachyandesitic composition confirms the evolved nature of the volcanic rocks drilled at this site. No samples were collected or analyzed for determination of carbonate, organic carbon, or organic nitrogen content during this week.

All archive half-cores from Holes U1377A and U1377B were measured and alternate-field (AF) demagnetized using the cryogenic magnetometer, and principal component directions have been automatically picked. In addition, 10 discrete samples from Hole U1377A have been AF or thermally demagnetized, but only natural remanent magnetizations were obtained for seven samples from Hole U1377B due to a malfunction of the AF demagnetizer. Both the archive half-core and discrete sample remanent magnetizations in Hole U1377A provided generally consistent, moderate to steep positive inclinations, reflecting southern

hemisphere reversed polarity. The archive half cores from Hole U1377B also yielded reversed polarity remanent magnetizations.

Whole-round and split-half physical properties measurements were completed for all sections from Hole U1377B, as was natural gamma ray radiation testing. The last group of discrete samples was chosen from Hole U1376B (through Core U1376B-5R-3) in collaboration with the paleomagnetists. The entire set of paleomagnetic, compressional wave velocity, and moisture and density measurements have been completed for all samples from Hole U1377B. The remainder of the expedition focused on preparing the data filtering program for future expedition use.

The Downhole Logging team gave their Site U1376 presentation this week and worked on finalizing site reports for Sites U1374 and U1376. Additionally, post-logging tests have been performed on the GBM with the main wireline.

One final sample was taken by the Microbiology group from Core U1377B-4R and processed for cell counts, molecular biology and in situ stable isotopes. In addition, 18 incubations were started with nine media targeting growth of sulfur oxidizers, iron cycling microbes and general heterotrophs. A stable isotope addition bioassay was also initiated for studying growth rates of subsurface microbes of Hadar Guyot. Sampling of previously initiated stable isotope addition bioassays from Sites U1373 to U1376 continued as the ship transited back to Auckland and the microbiology laboratory was cleaned and samples prepared for shipment.

EDUCATION AND OUTREACH

Both the education officer and the videographer continued blogging and conducting video broadcasts during the last week of this expedition. Over the course of the expedition, the education officer has posted photos, links and status reports daily, as well as a weekly trivia contest, to the JR Facebook page. During this time, the Facebook page has had 746,979 post views and gained 139 fans. He has also maintained the Expedition 330 outreach content on the

joidesresolution.org website, including posting 37 blog using three different blog accounts: JR junior (for kids age 8-12), Educator Ideas (for classroom teachers and informal educators) and Kevin Kurtz (for high school students and adults). The JR website has had over 10,339 visits during the course of the expedition with 4,943 new visitors. He also coordinated and facilitated, with the help of the videographer and the expedition scientists, 27 successful webcasts with schools and museums. Fifteen of the scientists in the science party participated in question and answer periods. Just over 1000 children and adults participated in the live webcasts, and one school recorded the webcast to show to the rest of their students, adding 750 viewers to the total. The videographer finished recording and editing her last videos “Leavin’ Louisville” and an official Exp 330 wrap up video.

TECHNICAL SUPPORT AND HSE ACTIVITIES

Technical staff engaged in providing full support for coring operations at Site U1377 and end of expedition activities. Other support technical activities included the following:

1. Continued minor software upgrades to various applications.
2. Deployed the towed magnetometer for the transit into Auckland.
3. Prepared laboratories for the upcoming STP visit to the ship.

No HSE incidents to report.