

**IODP Expedition 334: Costa Rica Seismogenesis Project (CRISP)
Week 4 Report (4 – 10 April 2011)**

OPERATIONS

Week 4 of Expedition 334, Costa Rica Seismogenesis Project (CRISP), began with the bit at 704.56 mbrf (171.36 mbsf) while XCB coring in Hole U1378B. XCB coring continued through Core U1379-63X short of the basement objective. Microspheres were run on Cores U1378B-30X, 40X, 50X, and 60X. A total of 47 XCB cores were taken over a 396.1 m interval, recovering 396.83 m of core (100.3%). Coring was terminated after trying to condition the hole for 14.5 hours. High top drive torque and lost circulation were major factors. The hole was plugged and then abandoned. The drill string was tripped back to the rig floor, the rig was secured for transit, and the beacon was recovered at 2042 hr ending Hole U1378B at 2045 hr on 6 April 2011. The total cored interval in Hole U1378B was 523.9 m with 526.69 m of core recovered for an APC/XCB combined recovery percentage of 100.5%.

After a move in DP mode from Site U1378 the vessel stabilized over Site U1380 (CRIS-10A) at 2130 hr 6 on April. The hole was drilled to a depth of 397.0 mbsf with a 9⁷/₈" RCB core bit with the center bit installed. The center bit was then pulled and RCB coring began at 397.0 mbsf. Coring continued through Core U1380A-10R to a depth of 482.4 mbsf. At this depth, it became difficult to circulate and high torque was observed on the top drive. We decided to do a wiper trip to remediate the poor hole conditions. It was necessary to pull back from 997.4 mbrf all the way until 853.0 mbrf before normal circulation and torque were restored. While attempting to return to bottom from 853.0 mbrf, the bit started taking weight at 920.0 mbrf. High torque and lost circulation made it impossible to return to bottom. At 1500 hours, preparations began to abandon Hole U1380A. The core barrel was retrieved and the hole was displaced with 120 barrels of 10.5 ppg mud and abandoned. The drill string was tripped back to the rig floor, the beacon was recovered at 1930 hours, and the rig was secured for transit, ending Hole U1380A on 8 April. A total of 9 cores were recovered after coring 85.4 m. The total length of core recovered at this site was 52.37 m (61.3%).

After an 11.4 nautical mile transit from Site U1380, the vessel stabilized over Site U1381 (CRIS-1A) at 2133 hours on 8 April. The RCB BHA was made up and the hole was spudded at 0330 hours on 9 April. Total cored interval on Hole U1381A at weeks end was 141.9 m with 59.43 m of core recovered (41.9%). The last core recovered during week 4 was Core U1381A-20R.

SCIENCE RESULTS

This week was dominated by the termination of holes and starting of new holes, thus this week was a really busy week for all laboratory groups. The site report chapters for Sites U1378, U1379 and U1380 had to be finalized and submitted and the Visual Core Description (VCD) sheets for these sites had to be reviewed and corrected. Besides this work, the normal core flow procedures of description, measurements and sampling are ongoing.

The material retrieved during the last week from Sites U1378 and U1380 was dominated by the monotonous sequence of predominately massive, well consolidated, olive green, terrigenous clayey silt to silty clay already cored at Site U1379. Intercalated in this sediment are fining and coarsening upward sequences consisting of lithic sands and abundant tephra layers. The basalt contact between the background sedimentation and the tephra layers as well as the sand sequences is sharp, whereas the top contact is gradational. Within this monotonous sequence sandy intervals become thicker and more common with depth. The identified tephra layers seem to be quite heterogeneous in composition. They range from light gray to pinkish/brownish white felsic tephra to pinkish gray/brown more mafic tephra and pinkish/greenish black mafic tephra. The felsic tephra layers are mainly (>90 vol.%) composed of fresh, clear, colorless, fine to coarse ash sized glass shards varying from angular blocky, cusped, flat and Y-shaped shards with nearly no bubbles to highly vesicular, pumiceous textures with many elongated bubbles. Dark gray, mafic ash layers consist predominantly of dark to light brown glass shards. Most of the glass shards have blocky shapes and are medium to poorly vesicular and show strong signs of alteration, especially in the deeper part of the hole. According to the nanofossil community the sediments cored at the different sites are of Pleistocene age, which is confirmed by the magnetostratigraphy. We were not able to core basement at Sites U1378 and U1380 because of unfavorable hole conditions.

At the end of this week we are coring in Hole U1381A. Even though the transit from Site U1380 to U1381 was only a short ~11 nm, it brought us into a new geological world. Unlike the other locations, Site U1381 is not situated on the upper plate of the Costa Rica Subduction Zone but on the down going oceanic plate. Thus the basement we are coring right now is in fact the upper part of the Cocos Ridge. It consists of dark gray, very dense, tough phyrlic to aphyric basalt. The dominant mineral species found in the basalt is feldspar followed by pyroxene. The basalt shows only minor to moderate signs of alteration

characterized by alteration halos along vesicle and fracture rims. Vesicles and fractures are filled with carbonates, clay minerals and pyrite.

The sediment at this site consists in the upper part mainly of light greenish gray, soft, clay sediments with minor layers of silty clay, and 3 tephra layers. Tephra layers range from 2 to 4 cm thick, show gradation and are partly disturbed and smeared out by rotary drilling. Biogenic components, especially nannofossils and diatoms are abundant throughout the cored sediment. Foraminifers, spicules, and radiolarians are present in trace amounts. The lower sediment cover consists of mainly dark grayish to yellowish brown, soft to hardened clay. The sediment is partly silicified and contains abundant biogenic components (> 50% spicules, diatoms, radiolarians, and nannofossils). Abundant tephra layers are also intercalated in this lower part of the sediment. They range in thickness from 1 to 8 cm, are massive or soft, show gradation and are partly disturbed and smeared out by rotary drilling. One exception is a 33 cm thick mafic tephra layer in Core U1381A-7R that also shows parallel and cross lamination and is silicified.

TECHNICAL SUPPORT AND HSE ACTIVITIES

During the week, the labs were busy processing and sampling cores. Shipping papers were generated for the upcoming port call and sent to the marine logistics coordinator on 8 April. A fire and boat was held for all on Monday, 4 April.