

**IODP Expedition 334: Costa Rica Seismogenesis Project (CRISP)**  
**Week 1 Report (15-20 March 2011)**

OPERATIONS

Costa Rica Seismogenesis Project (CRISP) began with the first line ashore in Puntarenas, Costa Rica at 0909 hr on 13 March 2011. Port call activities, including loading of drill collars, miscellaneous logging while drilling (LWD) support equipment, bulk sea gel and miscellaneous air freight began immediately after the early arrival. On the second day of port call three personnel joined the vessel for the upcoming expedition and the replacement RigNet transceiver was received and installed, completing the repair to the Aft RigNet VSAT dome. Day three of port call began with the arrival of the remaining (54) science and technical staff that will be sailing on Expedition 334. On day four of the port call, all LWD tools and support equipment arrived on board with the exception of the lithium batteries required for back up electrical systems of the LWD tool. The vessel departed Puntarenas, Costa Rica at 0106 hr on 17 March 2011 and completed the 97.2 nm sea voyage to Site U1378 (Prospectus Site CRIS-3B) at 0945 hr. Prior to the start of operations a pre-spud meeting was held with Transocean, IODP staff, and the co-chief scientists.

At the start of operations, it was quickly apparent that the handling equipment that had been provided by Schlumberger was suitable for neither the drill collar assembly nor the LWD tool assembly. Both lifting subs had to be machined by the ship's mechanics so that they would fit in the lifting elevators provided. After approximately 4 hours to make alterations, the assembly and testing of the LWD tools and the BHA began. A precision depth recorder (PDR) reading of 531.6 mbrf was recorded and the BHA, including the LWD tool were run in the hole to just above the seafloor. Hole U1378A was spudded at 0425 hours on 18 March. Logging while drilling continued uneventfully the rest of the day and by midnight

the drilled hole had reached 390.65 mbsf. The hole had advanced to 456.9 mbsf when erratic high torque and lost circulation forced a stop to drilling. The hole was conditioned and a wiper trip was made from 993.5 mbrf (456.9 mbsf) to 822 mbrf. After the erratic torque was eliminated and circulation was restored, the rig was shut down for an hour while a new top drive counterbalance line was installed on the top drive. Washing and reaming back to bottom resumed at 1000 hr and by 1200 hr, the bit had reached 841.42 mbrf. High torque and lost circulation continued to plague the operation and the drill string again had to be pulled to above the problem zone. After hole cleaning operations, another attempt was made to return to bottom. At 1730 hours after evaluating the progress, the hole was terminated in favor of spending more time at the next site. Hole U1378A was plugged and abandoned with 10.5 ppg mud. The top drive was then set back and the drill pipe and LWD BHA were pulled out of the hole and the rig floor was secured for transit at 0230 hr. on 20 March 2011.

After a 1.25 hour, 8 nm transit, the vessel was switched into DP mode and stabilized over Site U1379 (Prospectus Site CRIS-4A). The depth from the rig floor to the seafloor was recorded at 137.4 by the PDR. The seafloor was tagged at 137.4 mbrf and Hole U1379A was spudded at 0955 hrs. Drilling continued from 137.4 mbrf and at week's end the bit reached 502.87 mbrf (365.9 mbsf).

## SCIENCE RESULTS

The aim of IODP Expedition 334 is to understand the processes that control the triggering of large earthquakes at erosional subduction zones (convergent margins). Globally, ~80% of the earthquakes greater than magnitude 8 (also triggering large tsunamis) occur along convergent margins. There are two general types of convergent margins, accretionary and erosional, which are spread evenly around the circum-Pacific Ring of Fire. The working area of this expedition involves the only known erosional end member of convergent margins

within reach of scientific drilling. With a low sediment supply, fast convergence rate, abundant seismicity, and a change in subducting plate relief along strike, this area offers excellent opportunities to learn the causes of earthquake nucleation and rupture propagation. This project complements other deep fault drilling (San Andreas Fault Observatory at Depth and Nankai Trough Seismogenic Zone Experiment) and investigates the first-order seismogenic processes common to most faults and those unique to erosional margins. Expedition 334 is based on a part of Costa Rica Seismogenic Project (CRISP) Program A (IODP Proposal 537A-Full5), which is the first step toward the deep riser drilling through the seismogenic zone. This expedition will focus on constraining the boundary conditions of lithology, fluid flow, and thermal structure that trigger unstable slip in the seismogenic zone along a drilling transect at two slope sites. These slope sites might also serve as pilot holes for potential future proposed riser drilling to reach the aseismic/seismic plate boundary.

The scientific party arrived on board on 15 March. They spent the first week of this 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 each descriptive group (sedimentology, petrology, structure) have been set up. The core describing group used core sections from ODP Leg 197, which are available on board to practice core flow and description in DESClogik. 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 sampling and research plan was developed and will be agreed upon early next week. All personal sampling will happen during regular core flow.

The first ~6 days of our operational time are dedicated entirely to LWD. We

completed LWD operations at Site U1378, ~97.2 nm from the Osa Peninsula, Costa Rica, on 19 March reaching a total depth of 455 mbsf. The low resolution LWD measurements transmitted in real time to the surface have shown that the data being acquired are of good quality. Pressures measured in the hole while drilling followed the expected hydrostatic trend. LWD operations at Site U1379, 8 nm upslope from Site U1378, started at ~0400 hrs on 20 March. The depth into formation at the end of the week was to ~366 mbsf. Measured pressures in the hole while drilling follow the expected hydrostatic trend.

## EDUCATION AND OUTREACH

The expedition's education officer started blogging and posting pictures.

## TECHNICAL SUPPORT AND HSE ACTIVITIES

The Expedition 334 technical staff and scientists boarded on 15 March. IODP air freight was loaded. The technical staff went on shift upon sailing and the labs were readied for coring. Repairs were made to the cryogenic magnetometer's chiller. A Carver press was installed on the upper tween deck for Helium sampling.

The science party attended a life aboard the ship and lab safety training meetings. The oncoming staff was shown the muster stations and lifeboats.