

IODP Expedition 317: Canterbury Basin Sea Level

Week 9 Report (27 December 2009 - 2 January 2010)

3 January 2010

Operations

The week began drilling a dedicated logging hole, Hole U1353C, to 529 m DSF. The hole was swept clean with a 50-barrel high viscosity mud sweep, and displaced with 300 barrels of high viscosity 10.5 ppg mud. The triple combo logging tool string was rigged up without nuclear sources (neutron porosity, gamma ray density) to minimize the operational risk. The tool string descended to 621 m WRF and the hole was logged up from there. Next, the FMS-sonic tool string was assembled and run in the hole to 343 m WRF where an obstruction was encountered. The hole was logged up from 343 m WRF. A second attempt was made to run down with the FMS-sonic tool string but was only able to reach ~300 m WRF. Hole conditions while logging the tool upwards continued to deteriorate until complete hole collapse just below 202 m WRF. After working to free both the drill string and the logging string, the logging string partially re-entered the drill string. The drill string and the logging line were pulled up onto the rig floor from ~200 m DRF using T-bars. The hole could not be cemented with the logging tools stuck in the drill string and the hole completely collapsed as the BHA was pulled clear of the hole. The logging tools were rigged down and operations at Site U1353 ended at 2100 h on 28 December.

After a 7 nm transit from Site U1353, the vessel was positioned over Site U1354 (proposed site CB-02A) at 2320 h (UTC+13h) on 28 December. Coring in Hole U1354A began at 0415 h on 29 December and APC coring continued through Core U1354A-19H to a depth of 85.4 m DSF using non-magnetic coring assemblies. A 2-m section (64.9 - 66.9 m DSF) had to be drilled to advance through a section of shells and shell fragments. Core orientation was measured on the first three cores, but hard formation and incomplete piston strokes prompted a decision to remove the tool. Temperature measurements were not attempted on this hole because of poor hole conditions. Waiting for 10 minutes without circulation in shallow water was deemed too risky. Overall recovery for Hole U1354A using the APC coring system was 100%.

The vessel was offset 20 m south of Hole U1354A and Hole U1354B was piston cored to a depth of 77.2 m DSF with a total recovery of 77.52 m (100%). Because of the rough piston coring conditions noted on Hole U1354A, the core orientation and downhole temperature tools were not deployed. Coring was terminated at 77.2 m DSF because highly variable winds from the south caused positioning problems. Unable to keep the vessel within the required watch circle, the decision was made to wait on the weather to improve. The drill string was tripped back to just above the seafloor and the bit cleared the seafloor at 1245 h on 30 December, ending Hole U1353B.

Operations in Hole U1354C began at 0700 h on 31 December when the vessel was again able to maintain its watch circle over the new location. The ship was offset 20 m south from Hole U1354B. The hole was drilled to 65 m DSF with the center bit installed before two APC cores were taken. The core liner shattered on the second attempt and the APC system was replaced with the XCB system to core through a particularly dense layer of shells. Core recovery with the XCB was initially very good but deteriorated downhole. Coring with the XCB continued to 384.2 m DSF (Core U1354C-36X). The total penetration for Hole U1354C was 384.2 m. The total cored interval for Hole U1354C was 319.2 m, with 133.37 m of core recovered (42%).

The hole was swept clean with a 50-barrel high viscosity mud sweep and displaced with 320 barrels of high viscosity 10.5 ppg logging mud. A special logging string was made up in order to get all basic sensors without nuclear sources into a single run. The string provided resistivity (DIT), sonic compressional and shear (DSI), and natural gamma ray spectroscopy (HNGS) tools. The tool string tagged the bottom of the hole at ~505 m WRF. After a short "repeat section" was recorded from TD up to ~440 m WRF, the tool string was returned to TD and then recorded a main pass up to the seabed. The drill string was tripped back to 275 m DRF and a 12-barrel, 14-ppg cement plug was pumped. The logging tools were rigged down, the drill string was tripped to surface and the bottom hole assembly was broken down and secured for transit. After the beacons were recovered and the rig was secured for transit, operations at Hole U1354C, at Site U1354, and on Expedition 317 ended at 1200 h on 2 January and the vessel departed for the 24-h transit to Wellington.

Science Results

Site U1354 is situated on the shelf, mid-way between Sites U1351 and U1353. Three Holes (U1354A, U1354B and U1354C) were drilled for coring. Cores U1354A-1H through 19H (0-85 m CSF), U1354B-1H through 14H (0-73 m CSF) and U1354C-2H through 36X (65-384.2 m CSF), were all measured and described during this week. Cores above ~85 m CSF consist of gray and green homogeneous greenish gray mud with abundant shells and shell fragments, sandy mud with rare shell-rich layers, shell hash, marl, and thick and thin layers of well-sorted fine-grained sand. Cores below ~85 to ~180 m CSF consist of clayey mud with cm-scale thin beds of sand, and small amounts of shelly sandy mud. Cores below ~180 m CSF to TD at 384 m DSF had low recovery consisting of silt-rich sandy mud with small amounts of shell fragments. Subtle as well as distinct lithologic contacts were observed, including some likely to represent sequence boundaries.

The age of the cores at ~20 m CSF is 0.29 Ma, at ~60 m CSF is 0.44 Ma, and at ~74 m is 1.26-1.34 Ma based on nannofossil and benthic foraminifera. The Pleistocene/Pliocene boundary is located between Core U1354C-9H-CC and 10H-CC (122–133 m CSF). Core U1354C-12H (~150.3 m CFS) is 2.78 Ma in age and Sample U1354C-17X-CC (~193 m CFS) is 3.7 Ma in age. Based on nannofossils, the late Pliocene succession is missing at this site as at other shelf sites cored during this expedition. The age at bottom of Hole U1354C is 4.0–4.3 Ma based on nannofossils and planktonic foraminifers. Paleomagnetic

measurements revealed a polarity reversal from normal to reversed at 70 m CSF in Hole U1354A and at ~65 m CSF in Hole U1354B. The reversal and associated lithologic boundary are interpreted to include the Brunhes/Matuyama event.

Geochemical measurements of IW samples do not show a zone of low salinity and chloride observed at Site U1353. The fresh water wedge must disappear somewhere between Site U1354 and Site U1353. Gas abundance was generally low, with a small peak at 46 m CFS and a larger increase at ~200 m CFS to bottom of the hole.

Logging of Hole U1354C with a modified "sonic combo" tool string including natural gamma, resistivity, and sonic tools was successful from TD to the bottom of the drill string (384-110 m WSF).

Technical Support and HSE Activities

All measurements were completed on all cores recovered at the last site of Expedition 317. All samples were packed up and prepared for shipping to the scientists. All shipboard laboratories were cleaned and readied for the next expedition.