

Expedition 321: Pacific Equatorial Age Transect (PEAT II)
Week 4 Report (24-30 May 2009)

01 June 2009

OPERATIONS

Wireline logging in Hole U1337A was successfully concluded and all logging equipment was rigged down by 0900 hr on 25 May 2009. Three logging strings were deployed. The Triple Combo reached total depth of 449.8 m DSF and good quality logs were obtained. The second logging string consisted of the Vertical Seismic Imager. This tool also reached total depth and shooting stations were conducted at approximately 15 m intervals. The third logging string consisted of the FMS-sonic tool. This tool string reached a depth of 440.0 m DSF and also obtained good data. The drill string was then pulled back until the bit cleared the seafloor at 0930 hr 25 May ending Hole U1337A and beginning Hole U1337B.

The ship was offset 20 m west of Hole U1337A and the bit was positioned at a depth of 4473.0 m DRF to optimize the core break placement between the two holes maximizing recovery of a complete section. The seafloor “tag” depth of 4472.0 m DRF for Hole U1337A was used for Hole U1337B. APC coring continued through Core U1337B-27H to a depth of 245.2 m DSF. The FLEXIT core orientation system was deployed successfully for all but two APC cores. Non-magnetic core barrels were used through Core U1337B-20H and successful APCT3 temperature measurements were obtained with Cores U1337B-15H, 17H, and 19H at depths of 143.5, 162.5, and 181.5 m DSF respectively. Over pull for the APC ranged from 20K to 90K and all but 5 barrels (21H, 23H-25H, and 27H) achieved full stroke. Two cores (16H and 22H) had split liners. The first split occurred after recovery with the sectioned cores in the rack. The latter occurred in the core barrel prior to extraction. Average core recovery for the APC was 99.3%. Coring continued with a single XCB Core U1337B-28X to a depth of 251.9 m DSF, however, this barrel could not be recovered forcing Hole U1337B to be abandoned prematurely. The drill string was recovered back aboard ship and further analysis indicated that an errant shear pin stub from an earlier piston core had caused the XCB core barrel to jam in the bit seal assembly. Hole U1337B officially ended at 2245 hr on 27 May. Overall recovery for the hole using both APC and XCB coring systems was 96.6%.

The ship was again offset 20 m west and the drill string tripped to the seafloor. Hole U1337C was spudded APC Core U1337C-1H, which established a seafloor depth of 4478.6 m DRF. Core U1337C-2H extended the hole to a depth of 11.4 m DSF using non-magnetic core barrels and the FLEXIT core orientation system. A wash barrel (3W) was then deployed and the hole was washed to a depth of 169.4 m DSF. APC coring resumed at that depth and continued through Core U1337C-9H to a depth of 221.3 m DSF. Steel core barrels were used at this point because of high over pull levels ranging from 70K to 100K pounds. Full stroke was achieved with all cores except Core U1337C-6H, which was advanced by recovery. Average core recovery for the APC in Hole U1337C was 102.6%. Coring with the XCB system continued with Cores U1337C-10X through 33X

recovering 95.2% of the section. Total depth of the hole was 440.3 m DSF and overall recovery for the hole using both APC and XCB coring systems was 97.0%. The drill string was pulled clear of the seafloor at 1400 hr 30 May officially ending Hole U1337C. The final hole for Site U1337 (PEAT-7C) was spudded at 1645 hr 30 May after offsetting the ship another 20 m west. The next operations report (Week 5) will cover operations in Hole U1337D.

SCIENCE RESULTS

The scientists continue to work on cores from Holes U1337B and U1337C. Sediments recovered from Holes U1337B and U1337C covers most of the gaps from Hole U1337A and represents a complete and continuous Neogene sedimentary section. Hole U1337D is primarily planned to fill in few gaps including a ~0.5 m porcellanite (“baby chert”) layer at around 4717 m DRF and to obtain an extra Neogene sedimentary section for postcruise research.

Based on Holes U1337A and B, four lithological units have been identified.

UNIT I: Cores 1H-CC, 0 cm – 11H-2, 85 cm (0 – 93.35 CSF-A): alternating nannofossil, diatom and radiolarian oozes.

UNIT II: 11H-2, 85 cm – 23X/24X (93.35 – ~214 CSF-A): dominant constituent siliceous microfossils with varying amounts of nannofossils.

UNIT III: 23/24X – 48X-CC, 21 cm (~214 – 449.39 CSF-A): dominant constituent nannofossils, with generally low but sometimes common siliceous microfossils.

UNIT IV: 48X-CC, 21-39 (449.39 – unknown): aphanitic basalt with calcite veins.

Cores U1337B-1H through 27H and U1337C-1H through 24X has been imaged and described. Sediments show highly cyclic variability in color, lithology as well as in multiple sensor track data. Sediments near the top of each section contain dark brown calcareous ooze that gradually transitions to an alternating and highly mottled sequence of greenish gray to yellowish brown nannofossil ooze and biosiliceous ooze below. In this interval, numerous dolomite concretions were encountered both within cores and as fall-in debris. At approximately 170 m CSF-A, several intervals of laminated diatom ooze are present, some as thick as 150 cm. A thin interval of chert/porcellanite recovered in Section U1337C-11X-CC (about 240 m CSF) hampered core recovery in this interval. Sediments below are predominantly pale green to white nannofossil ooze and chalk but rhythmic intervals of slightly increased biosiliceous components are observed. Sediments generally show intense bioturbation in all lithologies with the exception of laminated diatom ooze intervals.

Cores retrieved at Holes U1337B and U1337C contain a full suite of microfossils including planktic and benthic foraminifers, calcareous nannofossils, radiolarians and diatoms. Laminated diatom mats of Miocene age, mostly composed of needle-shaped *Thalassiothrix* spp., appear well represented in Holes U1337B and U1337C, and are intercalated with massive diatom oozes. As for Hole U1337A, radiolarians are well represented throughout. Calcareous nannofossil and foraminifer abundance and preservation vary markedly through the section, ranging from samples dominated by calcareous microfossils to samples which are almost barren. A detailed nannofossil

biostratigraphy has been developed for Holes U1337A, U1337B, and U1337C. For Hole U1337A planktic foraminifers and diatom biostratigraphy has also been developed. Nannofossil assemblages are diverse and all Neogene zones are represented. Planktic and benthic foraminifers examined in core samples are generally well preserved, although abundances vary markedly depending on carbonate and silica content within the sediment. Changes in assemblage composition of benthic foraminifers appear related to major re-organizations in Pacific Ocean water masses during the middle and late Miocene.

Paleomagnetic measurements were completed on all APC cores from Holes U1337A, U1337B, and U1337C. Fourteen XCB cores from Hole U1337A were also measured. No useful results were obtained from XCB core measurements. The APC core data are being processed to establish the magnetostratigraphy at Site U1337. The FLEXIT tool measurements are being processed and initial data seems promising.

Stratigraphic correlation at Site U1337 over the upper ~200 m CSF-A is excellent with less satisfactory results with the onset of XCB coring. Scanned images are being used extensively in combination with whole-round susceptibility, density and natural gamma data to aid in the more difficult correlation sections. All cores from Hole U1337B and U1337C had been run through the whole round fast-track, whole round multisensor track, and natural gamma track systems. All discrete sample measurements of moisture and density and velocity from Holes U1337A and U1337B are completed. Split core reflectivity measurements are completed through Core U1337C-30X. Analyses of the data are in progress. Preliminary examination of the data indicate lithologic Units I and II display considerable variation in density and moisture content as a result of varying abundances of siliceous components in the prevailing nannofossil ooze. The properties become more uniform in the more consistently carbonate-rich Unit III. The whole round properties display similar trends in variation among the lithologic units. The GRA density and natural gamma logs are particularly sensitive to small-scale variation in the sediment.

Geochemical analyses continue on interstitial water and bulk sediment samples from Site U1337. The CaCO_3 content vary from 80-90 wt% below 200 m CSF-A and is consistent with the carbonate rich nannofossil ooze. The upper 200 m CSF-A shows cyclic variability of CaCO_3 content, and is consistent with the carbonate rich nannofossil oozes and siliceous rich oozes. Total organic carbon (TOC) measurements have been completed. The TOC vary between 0-0.5 wt%, below 100 m CSF-A the TOC values become less than 0.2 wt%.

Downhole logging operations in Hole U1337A ended in the morning of May 25. Three tool strings were deployed: a modified triple-combo (natural gamma ray, density and resistivity), a VSI (Versatile Seismic Imager) to acquire a vertical seismic profile, and a FMS (imaging)-sonic. The wireline heave compensator was used throughout the deployment, and acceleration measurements were taken to evaluate its performance.

After acquisition, the log data were transmitted to LDEO for further processing, and the processed data are now available on the ship.

TECHNICAL SUPPORT AND HSE ACTIVITIES

The shipboard labs continue to process cores and samples from Holes U1337B and U1337C. The assistant lab officers and mates conducted mammal watch for VSI logging on May 24. No mammal was sighted throughout the entire period. The G gun parallel cluster was used in the measurement. No issue was experienced with the guns and the configuration. Two safety meetings were held, one for each shift. A briefing was given by each staff updating issues and concerns in their work area. Sample plans regarding Holes U1337B and U1337C were introduced.