

Expedition 321: Pacific Equatorial Age Transect (PEAT II) Week 7 Report (14-22 June 2009)

24 June 2009

OPERATIONS

Hole U1338D

The drill string was pulled clear of the seafloor at 2015 hr marking the beginning of Hole U1338D. This hole was only planned to recover a few instructional cores for the upcoming expeditions. Hole U1338D was spudded at 2150 hr 14 June 2009 and Core 1H established a seafloor depth of 4212.6 m DRF. Three APC cores were recovered to a depth of 23.9 m DSF. APC core recovery was 103.7%. The coring tools were secured and the drill string was pulled clear of the seafloor at 0145 hr 15 June. The top drive was set back, all knobby joints were laid out, the drill string was recovered, the drill collars were stowed in the forward main deck tubular rack, and the rig floor was secured for transit to port. At 1030 hr 15 June control was transferred to cruise mode on the bridge and the vessel began the anticipated 7.6 day transit to San Diego.

Transit to San Diego

The vessel departed Site U1338 about 4.5 hr ahead of the projected schedule on a course of near due north. With all propulsion motors on line, only light to moderate winds off the forward quarter, moderate to calm seas, and an appreciable current boost, the vessel made excellent speed. Expedition 321 (PEAT-2), the second and final segment of the Pacific Equatorial Age Transect, was officially concluded at 1715 hr, 22 June 2009 with the first line ashore at the 10th Avenue Marine Terminal, San Diego Harbor. The transit from Site U1338 was accomplished in 7.3 days at an average speed of 10.5 kts.

SCIENCE RESULTS

All cores from Holes U1338A, U1338B and U1338C were finished processing. Cores from Hole U1338D were not processed and were saved to be used as practice cores. Approximately 415 m of nannofossil ooze and chalk with varying concentrations of diatoms and radiolarians overlies early Miocene seafloor basalt at Site U1338. The sedimentary section is divided into three lithologic units. Pleistocene through middle Pliocene sediments of Unit I are characterized by multicolored nannofossil and siliceous ooze. Unit II is predominantly composed of light green and light gray nannofossil ooze with occasional darker intervals with abundant siliceous microfossils of the upper Miocene to middle Pliocene. White, pale yellow, light greenish gray, and very pale brown nannofossil oozes and chalks dominate Unit III of lower to upper Miocene, although slightly darker green and gray intervals with larger amounts of siliceous microfossils remain present. Lower Miocene seafloor basalt (Unit IV) was recovered at the base of the sedimentary section.

All major microfossil groups have been found in the ~415 m thick succession of Holocene to lower Miocene sediment bulge recovered from Site U1338. The nannofossil, foraminiferal, radiolarian, and diatom datums and zonal schemes generally agree. Benthic foraminifers occur continuously throughout the succession recovered in Hole U1338A, and show generally good preservation. The overall assemblage composition indicates lower bathyal to abyssal paleodepths. Marked variations in downcore abundance and species distribution reflect major

changes in global climate linked to fluctuations in ice volume and re-organization of Pacific Ocean circulation during the Neogene.

Stratigraphic correlation provided a complete spliced record to a depth of approximately 260 m CCSF-A. Several gaps were seen between 280 and 360 m CCSF-A. Comparison of GRA density records with well logging density data suggests that no more than a meter of section was lost in any of the gaps. The linear sedimentation rate decreases from approximately 29 m/Ma in the Miocene to 13 m/m.y. in the Pliocene-Pleistocene.

Measurements of natural remanent magnetization (NRM) indicate moderate magnetization intensities (on the order of 10^{-3} A/m) for depth intervals of 0-50 m CSF-A, 280-225 m CSF-A, and 295-395 m CSF-A. Polarity reversal sequences of these intervals are provisionally correlated to the Brunhes to the upper part of the Gilbert Chron (0 to ~4 Ma), Chron C4An to C5n (~9 to 11 Ma), and Chron C5r to C5Br (~12 to 16 Ma) of the GPTS, respectively (Fig U1338-B-1). Sedimentation rates increase downcore from ~12 m/m.y. at the top to ~30 m/m.y. near the bottom.

Physical properties measurements on whole-round sections and samples from split cores display a variation strongly dependent on the relative abundance of biosiliceous and calcareous sediment components at Site U1338. Lithologic Unit I at Site U1338 is characterized by low wet bulk density that decreases from 1.4 g/cm^3 near the seafloor to 1.2 g/cm^3 at the base of the unit, as a result of an increasing abundance of radiolarians and diatoms with depth. Unit II is characterized by increasing wet bulk density with depth, down to approximately 175 m CSF-A. Below this depth, an increase in the abundance of siliceous microfossils produces a broad density minimum. Unit III is characterized by a higher and more uniform carbonate content. Wet bulk density increases from roughly 1.5 g/cm^3 at the top of Unit III to 1.7 g/cm^3 at the base of the unit. Grain density varies over a narrower range in Unit III than it does in Units I and II and displays an average, 2.64 g/cm^3 , nearer to that of calcite.

The interstitial water and bulk sediment samples from Site U1338 reflect large variations in the sediment composition resulting from shifts in carbonate versus opal primary production. The large scale redox state and diagenetic processes of the sediment column are related to the overall changes in sediment composition. The interstitial water chemistry points to seawater circulation in the basement while the basement itself appears to exert little influence on the geochemistry of the sediments and interstitial waters.

TECHNICAL SUPPORT AND HSE ACTIVITIES

A safety meeting was held for both shifts. The technical staff was informed of the logistics plan for San Diego port call. Shipping papers were prepared and sent to shore for US Custom declaration. An upright refrigerator was re-located in the Bridge Deck Hazardous Store for dry chemical storage. End of Cruise activities were carried out for Expedition 321 scientists. All personal, samples, data boxes were collected and secured.