

## **Expedition 321: Pacific Equatorial Age Transect (PEAT II) Week 2 Report (10-16 May 2009)**

18 May 2009

### **OPERATIONS**

The transit to Site U1336 (PEAT-5C) began at 1636 hr 9 May after completing the transfer of the dynamic positioning system vendor from the JR to a small boat that was standing by at the Honolulu Harbor outer sea buoy. The transit to the first Expedition 321 drill site continued with speed varying considerably due to fluctuating currents and eddies surrounding the Hawaiian Islands. Average transit speeds ranged from 9.9 to 10.7 kt with 135 turns on both shafts. On the 3<sup>rd</sup> day of transit our speed further reduced to 9.0 to 9.9 kt due to the combined effects of the opposing Northern Equatorial Current and winds of 25-30 kt off the forward quarter. One propulsion motor remained off-line as field coil replacement continued. On the morning of 11 May, after several days of discussions with the science team, the decision was made to divert our course from Site U1336 (PEAT-5C) to Site U1337 (PEAT-7C). The decision was driven by several issues including (1) slower than anticipated transit speeds to date, (2) time spent conducting automated station keeping (ASK) sea trials took longer than planned, (3) addition of VSI (Versatile Seismic Imager) to the suite of wireline logging tools to be deployed at Site U1337 (PEAT-7C), (4) basement projections deepened by 50 m (for all holes) due to findings of Expedition 320, and (5) scientific trade-offs in general between continued coring at Site U1336 (PEAT-5C) versus doing a more complete program at Site U1338 (PEAT-8D). During the transit, permission was requested to change the drilling plan exchanging prospectus site PEAT-8C for a new site PEAT-8D located nearby. The target drill site was moved to avoid turbidites from a nearby sea mount after detailed review of the seismic data. The proposed new site has a slightly more compressed geologic package and has a slightly shallower water depth. Transit speeds continued to be slower than anticipated ranging from 9.0 to 9.9 kt until we began getting a boost from the Equatorial Counter Current on the 16<sup>th</sup> of May. At the conclusion of this weeks report we were making ~10.5 kt with the expectation that this will continue to increase over the next few days. Estimated time of arrival at Site U1337 (PEAT-7C) is early morning 19 May 2009.

### **SCIENCE RESULTS**

Scientists began practicing core flow using Expedition 320T cores at the beginning of the week. The rest of the week was spent describing cores from Hole U1336B and preparing site summary reports. A total of 20 cores (320-U1336B-1H through 20H) were split and described.

At Site U1336, ~300 m of pelagic sediments are divided into three major lithologic units. The sediments are composed mainly of nannofossil oozes, nannofossil chalks, and chert. The early to middle Miocene sedimentary sequence of Unit I contains more radiolarians, clay, foraminifers, and diatoms relative to the early Miocene to early Oligocene sediments below about 70 m CSF-A. Subtle changes in the relative proportions of these minor components produce meter-scale dark-light color cycles and two diatom rich layers. Numerous rounded fragments of pumice occur throughout this unit. The

oxidation-reduction reactions responsible for the observed vivid colors and pore water chemistry changes are likely fueled by enhanced availability of organic carbon relative to overlying and underlying sediments. Thin chert layers were encountered near 124 m in Unit II but only broken fragments were recovered. More abundant chert layers are common in the lower third of the recovered sequence.

Calcareous micro- and nannofossils occur throughout the 300 m thick sediment sequence recovered at Site U1336, showing an age span from late middle Miocene at the seafloor to early Oligocene at the terminal depth. The compositions of planktic foraminiferal assemblages are biased by dissolution causing low abundances dominated by deeper dwelling forms. Radiolarians are restricted to the upper 170 m of the sediment column and diatoms to the uppermost 60 m. Diatoms are poorly preserved whereas radiolarians show good to moderate preservation. These are distributed unevenly over the ca. 20 m.y. long cored interval, with about 80% concentrated to the Miocene section (12-23 Ma). Benthic foraminifers are characterized by diverse assemblages from lower bathyal to abyssal paleodepths. Preservation is moderate in the ooze interval of the upper ca 170-180 m, and deteriorates in the chalk and chert interval below that depth. The general abundance of benthic foraminifers is low.

All cores from Hole U1336B were processed for thermal conductivity and moisture and density and split-core velocity. The results generally match those of Hole U1336A. Notable differences are grain density values that average  $\sim 0.1 \text{ g/cm}^3$  less than those of Hole U1336A and x-direction velocities that average  $\sim 50 \text{ m/s}$  higher than Hole U1336A velocities. The overall characteristics of Site U1336 are higher variability of all physical properties in the lithologically more diverse Unit I, a relatively uniform Unit II, and significant increases in bulk density (to  $\sim 1.9 \text{ g/cm}^3$ ) and velocity (to 2100 m/s) in Unit III.

Paleomagnetic data were collected for Hole U1336B and correlated with the results from Hole U1336A. A continuous magnetostratigraphy for the middle-early Miocene was constructed from the base of polarity zone C5r to Chron C6n for the upper 90 m CCSF (composite core depth below sea floor). Below this depth, the magnetization intensity of the sediments decreases below analytical noise level. The loss of magnetization intensity correlates with the color change from brown to green sediments.

Correlation and splicing of data from Holes U1336A and U1336B resulted in a continuous spliced section to a depth of 138.50 m CCSF. Magnetic susceptibility was used for the correlation until a depth of approximately 94 m CCSF. Density (GRA) was sufficient for the final 40 m. Overlapping disturbed intervals in both holes, as well as low signal strength precluded deeper meaningful correlations.

The geochemists have prepared samples for conducting analyses upon arrival at Site U1337 (PEAT-7C). Samples from Hole U1336B have been freeze dried and powdered ready for weighing for  $\text{CaCO}_3$ , TOC (total organic carbon), bulk sediment and bulk carbonate ICP-AES analyses.

The downhole measurements group finalized the wireline logging program planned for Site U1337 (PEAT-7C). The current plan includes a VSI to acquire a vertical seismic profile. The VSI is being currently tested for deployment. Early in the week the scientists received an introduction to downhole logging techniques and tools.

#### **TECHNICAL SUPPORT AND HSE ACTIVITIES**

Technical staff prepared the labs to process cores from Hole U1336B. Training was conducted for the core splitter for the technical staff. Sample classes were given by the curator to scientific party and technical staff. Core flow was introduced to all staff. The core reefer was re-arranged to accommodate the latest boxed cores. Physical counts were conducted for items on the shopping list. Air conditioning in the underway lab was repaired and the navigation system (Winfrog) is now functioning.