

Expedition 321: Pacific Equatorial Age Transect (PEAT II)
Week 3 Report (17-23 May 2009)

25 May 2009

OPERATIONS

The transit to Site U1337 (PEAT-7C) continued with the ship getting a boost from the Northern Equatorial Counter Current, calm seas, and light winds. At one point the ship was making in excess of 12.5 kt. Ships clocks were advanced 3 times during the week placing the ship on Pacific Standard Time (PST) for the duration of the expedition. During a routine inspection it was discovered that the passive heave compensator (PHC) rod seals were burned up and required replacement. It appeared that they had been run dry (without adequate lubrication). The PHC seals were replaced while underway. The ship arrived on location the morning of 19 May and control was shifted from cruise mode to Automated Station Keeping mode in the dynamic positioning (DP) room. The primary positioning reference was via GPS however an acoustic beacon was deployed as a back-up. The pipe trip to the seafloor was slow due to the need for measuring (strapping) and drifting (internal diameter verification) of all tubulars and the picking up of the drill collars from the main deck storage rack. At 0300 hr 20 May the top drive was picked up however the tilt/counter balance feature was not functional. Four hours were spent troubleshooting and repairing the top drive before spacing out the drill string and deploying the first APC core barrel. With the bit positioned at 4467.0 m DRF the first APC barrel was pressured up and fired. Upon recovery the APC cutting shoe was found severely damaged and the core barrel was empty. To confirm the approximate seafloor depth the drill string was lowered and the mudline was "tagged" twice at about the same depth of 4472.0 m DRF. This depth was taken as the official seafloor depth for the hole, the bit was repositioned 1.0 m lower at 4468.0 m DRF, and Hole U1337A was spudded at 1115 hr. Core 1H recovered 0.19 m of core and once again the APC cutting shoe showed signs of having impacted something very hard. APC coring continued normally from there, however, and APC coring was suspended at a depth of 195.5 m DSF due to a 90 kip over pull. Non-magnetic core barrels were used for all cores except core 21H. A 60 kip over pull for Core U1337A-20H led to a return to steel core barrels. Average core recovery for the APC was 101.6%. The FLEXIT core orientation was conducted for all cores except for Core U1337A-1H with apparent good success. In addition, five successful APCT3 temperature measurements were taken with Cores U1337A- 5H, 7H, 9H, 11H, and 13H at 43.5, 62.5, 81.5, 100.5, and 119.5 m DSF respectively. XCB coring continued with Cores U1337A-22X through 48X achieving an average recovery of 87.1%. A piece of basement along with the sediment/basement contact was recovered at the base of Core U1337A-48X. Total depth of Hole U1337A (PEAT-7C) was 4921.8 m DRF or 449.8 m DSF. Overall recovery for the hole using both APC and XCB coring systems was 93.4 %. A wiper trip revealed no ledges or bridges and there was no fill identified at total depth. The lockable float valve (LFV) was locked open, the hole displaced with heavy 10.5 ppg logging mud, and rig-up for wireline logging began at 1130 hr 23 May. Logging with the first tool string, the triple combo, continued through the remainder of the day.

SCIENCE RESULTS

The week began with the coring of the first hole at Site U1337 (PEAT-7C). Site U1337 was proposed for drilling to focus on the paleoceanographic events in the early and middle Miocene. The latest Oligocene through the middle Miocene appears to have been a time of relative warmth comparable to the latest Eocene. However, the variability in the isotopic record of the early to middle Miocene is larger than that of the Eocene and may indicate more variability in climate and in global ice volume. The recovered sediment column at Hole U1337A represents a complete and probably continuous Neogene sedimentary section.

All cores from Hole U1337A have been imaged and described. Sediments in Core U1337A-1H through 33X show gradual but cyclic alternations of lithologies that reflect varying amounts of nannofossils, diatoms, and radiolarians. The scale of alternations is generally 50 to 100 cm. Dolomite concretions and diagenetic color bands are common throughout. Several thick intervals of laminated diatom ooze occur in Cores U1337A-17H through 23X. These intervals are dominated by an abundance of elongated *Thalassiothrix* sp. diatoms and represent diatom mat deposition. Below Core U1337A-23X sediments are dominated by nannofossil ooze but with cyclic intervals of biosiliceous components. Cores U1337A-35X through 39X, sediments are mainly nannofossil chalk with thin intervals of slightly increased radiolarian content continue cyclic alternations throughout the cores. Sediments below Core U1337A-39X are uniformly nannofossil chalk. Small fragments (<1 mm) of volcanic glass and glassy pumice are observed in most of the lower sections with occasional larger fragments, some up to 4 cm). Sediment biscuits are formed from drilling disturbance in Cores U1337A-34X and below. Core U1337A-48X contains aphanitic basalt with calcite veins indicating penetration into the basement seafloor.

The section at Hole U1337A seems continuous and contains a full suite of microfossils including planktic and benthic foraminifers, calcareous nannofossils, radiolarians and diatoms. The Miocene shows slightly higher rates of sedimentation compared to the Pliocene/Pleistocene section. Four cores through the middle/late Miocene boundary interval are characterized by cm- to dm-thick diatom mats, mostly composed of needle-shaped *Thalassiothrix* and *Lioloma*. Diatoms and radiolarians are well represented throughout with radiolarians more abundant in the lowermost sections of Hole U1337A. The dominance of biogenic silica decreases progressively downhole, resulting in better preservation of the biogenic carbonate. The base of Hole U1337A is uppermost Oligocene (between 23.2 and 24.4 Ma), with the Oligocene/Miocene boundary occurring in Core U1337A-48X. Calcareous nannofossil and foraminifer abundance and preservation vary markedly through the sediment column, ranging from samples dominated by calcareous microfossils to samples which are almost barren. The nannofossil assemblages are relatively diverse and provide an excellent biostratigraphic framework with Zones NN1-NN21 represented. Benthic foraminifers are generally well preserved throughout the succession, although abundances fluctuate considerably. Changes in assemblage

composition point to marked variations in organic export flux to the seafloor and in deep-water ventilation, especially during the early to middle Miocene.

All cores from Hole U1337A had been run through the whole round fast-track, whole round multisensor track, natural gamma and thermal conductivity sensors. For moisture and density (MAD) measurements, wet mass has been measured on samples from cores through Core U1337A-45X. Dry mass and volume measurements have been made through Core U1337A-15H. Velocity and reflectivity measurements have been made through Core U1337A-45X. Analyses are continuing. The most notable feature to this point is the distinct increase in velocity at the transition from ooze to chalk at approximately 350 m CSF-A. Data from the whole round multisensor track were downloaded for stratigraphic correlation immediately after uploading and checked for errors. Susceptibility and density data for most of the upper 200 m CSF-A have reasonably strong signals allowing good correlation with data from subsequent holes.

The geochemists continue to process standard shipboard geochemical analysis of pore water, total organic carbon and total carbon. Paleomagnetic measurements are completed on all APC cores and the data are being processed.

The downhole logging team continued planning for deployment of three tool strings after completing coring at Hole U1337A. Logging activities began on May 23 with the modified triple-combo (natural gamma ray, density and resistivity) tool string after performing a series of tests on the wireline heave compensator. A FMS (imaging)-sonic log and a VSI (Versatile Seismic Imager) to acquire a vertical seismic profile are planned for Hole U1337A.

TECHNICAL SUPPORT AND HSE ACTIVITIES

During this week, the technical staff reviewed the current inventory on board to make certain appropriate supplies available for the next expedition.

The core description table was moved towards port side by 6" to give the core describers more space to work. Port side of the description table is not being used except to place over flow cores. The stratigraphic correlator station was switched with the sedimentologist's smear slide station. With the new configuration, the starboard side is now a continuous station for the sedimentologists.

The GG gun was rigged up and solenoid valves were tested in preparation for the VSI at Hole U1337A.