

**Expedition 321: Pacific Equatorial Age Transect (PEAT II)
Week 6 Report (7-14 June 2009)**

15 June 2009

OPERATIONS

Hole U1338B

Hole U1338B officially began when the drill string cleared the seafloor at 1900 hr 6 June. The drilling line was slipped and cut while offsetting the ship another 20 meters to the west of Hole U1338A. With the drill bit placed at 4208.0 m DRF to optimize the core breaks between holes, the APC was deployed, and a water core was recovered. After checking the drill string tally it was discovered that the driller was off by a single joint of drill pipe. This single was added to the string and with the bit positioned at the same depth, the 2nd hole for Site U1338 (PEAT-8D) was spudded at 2330 hr 6 June. Core recovery with APC core 1H determined the seafloor depth as 4209.9 m DRF. Except for a short drilled interval of 2.5 m to adjust the core breaks, continuous APC coring continued through Core 20H to a depth of 188.1 m DSF using the FLEXIT core orientation system and non-magnetic coring assemblies. FLEXIT and steel core barrels were then used as APC coring continued through Core 42H to a depth of 387.4 m DSF. This was the second deepest APC hole in scientific ocean drilling history surpassing the 378.0 m DSF depth achieved during Expedition 320 in Hole U1335B. APC extraction overpull reached 100K pounds on 19 of the 42 total cores taken including the last 11 cores. Full stroke was achieved on all but 2 cores (30H and 31H) through the interval from 276.1 to 282.9 m DSF. The Core 1H liner was broken, the liner for Core 13H was cracked at the bottom, and the liner in Core 42H was recovered split. Average core recovery for the APC was 104.1%. Coring continued with three XCB Cores 43X through 45X to a depth of 416.1 m DSF. The basement contact was recovered in Core 45X and the XCB system recovered 57.9% of the interval penetrated. Recovery was problematic with the XCB system and the material that was recovered suffered significantly from the typical "bisquiting" effect. Total depth of Hole U1338B was 4626.0 m DRF or 416.1 m DSF. Overall core recovery using both APC and XCB coring systems was 100.9%. The hole was swept clean with 50 barrels of attapulgate mud, a wiper trip revealed no ledges or bridges, and there was no fill identified at total depth. The LFV was locked open; the hole displaced with heavy 10.5 ppg logging mud, and the end-of-pipe (EOP) was placed at 84.7 m DSF in preparation for logging. Wireline logging in Hole U1338B was successfully concluded and all logging equipment was rigged down by 1615 hr on 11 June 09. All logging with acoustic sources was conducted during day light hours to conform to established mammal watch protocols including pre-shooting mammal watch and soft start procedures for the air guns. The drill string was then pulled back until the bit cleared the seafloor at 1655 hr 11 June ending Hole U1338B.

Hole U1338C

The ship was offset 20 m to the west of Hole U1338B while the drilling line was slipped and cut and the Rigwatch drawworks/block position encoder was recalibrated. The drill bit was placed at 4204 m DRF (same as for Hole U1338A) to optimize the core breaks between Hole U1338B and Hole U1338C. The APC was deployed, and a water core was recovered. Because 2.7 m of core had been recovered in Hole U1338A with the same bit placement, it was suspected that vessel heave, induced by the large long period swell train from the south, had impacted the core recovery. The drill string was lowered another 3.0 m and the bit was re-positioned at 4207.0 m

DRF. Hole U1338C was spudded at 2135 hr 11 June. Core recovery with APC Core 1H determined the seafloor depth as 4212.7 m DRF. Continuous APC coring continued through Core 21H to a depth of 189.8 m DSF using the FLEXIT core orientation system and non-magnetic coring assemblies. FLEXIT and steel core barrels were then used as APC coring continued through Core 44H to a depth of 396.9 m DSF. Indications were that Core 45H fully stroked and drill-over was required to extract it from the formation. Retrieval was delayed because a bent core barrel initially prohibited entry into the drill string. Repeated jarring with the wireline jars eventually sheared the overshot pit so the sinker bar string was recovered and the FLEXIT core orientation tool was removed. The sinker bar assembly was re-deployed and the core barrel was immediately recovered without any further incident. It was deemed prudent at this point to leave the FLEXIT tool out of the assembly for the remainder of the coring process. Coring continued through Core 47H to a total depth of 414.4 m DSF setting a new all time depth record for the APC. This surpassed the standing ODP record set on 7 August of 1992 (Leg 145) when the APC recovered 42 piston cores to a total depth of 398.3 m DSF in Hole 882A. APC extraction overpull reached 100K pounds on Cores 22H through 47H. Drill over prior to removal from the formation was required for 22 cores and full stroke was achieved on all but 4 cores (31H and 45H through 47H). Only two cores recovered with imploded liners (Cores 10H and 12H) however several barrels were bent during the coring process and several piston rods had to be adjusted and re-pinned due to over torqued threads that caused miss-alignment of the rod grooves. Overall core recovery for the APC was 104.4%. The drill string was pulled clear of the seafloor at 2015 hr 14 June ending Hole U1338C.

Hole U1338D

Hole U1338D was a dedicated hole to recover a few practice cores to be used during the upcoming expedition. 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%. Unofficial APC/XCB coring totals for Site U1338 (PEAT-8D) include 139 total cores, 1261.9 m penetrated, 1220.41 meters recovered, for 96.7% recovery. The coring tools were then secured and the drill string was pulled clear of the seafloor at 0145 hr 15 June. The top drive was set back, the knobby joints were laid out, and recovery of the drill string was begun.

SCIENCE RESULTS

Hole U1338B and U1338C was planned to target core gaps and several remaining areas beyond ~240 m CSF-A that needed full recovery. Hole U1338D was primarily planned to get few “practice” cores to be used during the upcoming Bering Sea expedition.

The lithostratigraphy team completed imaging and describing cores from Hole U1338A and U1338B. In Hole U1338C Cores 1H through 24H have been imaged and described. Sediments are predominantly nannofossil ooze containing minor but varying amounts of diatoms, radiolarians, and calcite components. Several intervals of diatom-rich lithologies occur cyclically within each hole. Cores are intensely bioturbated and mottled, with cm- to dm-scale diagenetic color banding common throughout. Pyrite is a common accessory mineral forming small burrow casts and disseminated in burrow-fill sediments. Chert was recovered in Core U1338B-31H mostly as drilling breccia. Near the base of each section, the dominant lithology recovered was nannofossil chalk. In this lithology, manganese oxide was the most common accessory mineral

forming small accretions throughout most of the cores. A sharp color change from pale green to yellow occurs several meters from the base of each hole. Faulted yellowish brown nanofossil chalk directly overlies basement in each hole. In Hole U1338B, a thin interval of dark brown of manganese oxide slurry (XCB disturbance) was recovered about 1 m above basement. Small fragments of weathered aphanitic basalt represent basement recovery at the base of each Holes U1338 A and U1338B.

The section at Site U1338 appears continuous and contains a full suite of microfossils including calcareous nanofossils, planktic and benthic foraminifers, radiolarians and diatoms. The Miocene shows higher rates of sedimentation compared to the Pliocene/Pleistocene section. The nanofossil, foraminiferal, radiolarian, and diatom datums biostratigraphies are relatively well constrained and zonal schemes generally agree throughout. The base of Hole U1338B is early Miocene in age (~17.8 Ma). Calcareous nanofossil and foraminifer abundance and preservation vary markedly through the sediment column, ranging from samples dominated by calcareous microfossils to samples which are almost barren. Nanofossil Zones NN4-NN21 are represented and the diverse assemblage is, in general, moderately preserved. Radiolarians are well to moderately preserved, except in the lowermost portion (early Miocene), which is barren of radiolarians. Planktonic foraminiferal assemblages are diverse and typical of tropical eutrophic environments. Benthic foraminifers are overall well preserved, although abundances fluctuate considerably depending on carbonate/silica content. The abundance of the diverse diatom assemblages varies abundant to common throughout and valves are moderately preserved.

Stratigraphic Correlation at Site U1338 over the upper ~277 m CCSF-A is good. Poor recovery below this depth in Hole U1338A made identification of a complete section more difficult and some small gaps may be present below this level. Final identification of gaps awaits full WRMSL measurement, core imaging, and comparison with downhole logs.

Natural remanent magnetization (NRM) of archive-half sections of all APC cores from Holes U1338A and U1338B was measured, and measurements of APC cores from Hole U1338C continue. The Flexit core orientation tool was deployed in conjunction with all APC cores. Measurements of NRM above ~60 m CSF-A and between 200 to 250 m CSF-A indicate moderate magnetization intensities with a patchy but generally weak viscous (VRM) or isothermal remanent magnetic (IRM) coring overprint, and polarity reversal sequences are usually clearly recognized. Cores below ~300 m CSF-A also have moderate magnetization intensities, but they are overprinted more strongly due to the usage of a steel core barrel. Except for these depth intervals, remanence intensities after AF demagnetization at peak fields of 20 mT are reduced to values close to magnetometer noise level in the shipboard environment.

All discrete sample measurements of moisture and density and velocity are completed for Hole U1338A. Hole U1338B was sampled to fill in gaps of recovery in Hole U1338A, and analyses are in progress. Split core color reflectivity measurements are completed through Core 321-U1338C-30H. Preliminary examination of the data indicates that variation of all the physical properties largely reflects the relative abundance of biogenic siliceous and calcareous components. The greatest variability in properties is in the top 50 m of the sediment section. Between 50 and 200 m, cycles in the abundance of siliceous components are reflected in regular variations in bulk density, natural gamma radiation, and magnetic susceptibility. Below 200 m

CSF-A the sediment properties are more uniform reflecting a more uniform and high carbonate content.

Standard geochemical analyses of IW and bulk sediment samples from Holes U1338A and U1338B were completed. The high resolution interstitial water sampling has revealed interesting features including large dissolved Mn and Fe peaks in the upper 100 m CSF-A. The Ca and Si content of the bulk sediment samples mirror each other precisely downhole. This demonstrates the importance of the biogenic carbonate versus silicate production, or preservation, in determining the sediment composition at the site.

Downhole logging operations in Hole U1338B started in the night of June 9 and ended in the afternoon of June 11. Three logging strings were deployed. The Triple combo reached total hole depth of 416.1 m DSF and good quality logs were obtained. The second logging string consisted of the FMS-sonic tool. This tool string also reached total depth of 416.1 m DSF. The third and final logging string consisted of the Vertical Seismic Imager (VSI). This tool reached total hole depth and shooting stations were conducted at approximately 15 m stations. The wireline heave compensator was used throughout the deployment, and acceleration measurements on the ship and in the tool string were taken to evaluate its performance. After acquisition, the log data were transmitted to LDEO for further processing, and the processed data will be sent back to the ship. Preliminary logging results established lithology around the “baby chert” layer, which is represented by an interval of high density and resistivity.

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 June 11. No mammal was sighted throughout the entire period. The Sercel gun cluster arrangement was used for VSP test. We received the preliminary activity list for the San Diego port call, and began preparing cores and other shipments going off in San Diego.