IODP EXPEDITION 320T: SEA TRIALS TRANSIT
SITE U1330 SUMMARY

February 26, 2009

Site U1330 is a reoccupation of ODP Leg 130 Site 807, which is situated near the equator (3º 36.4' N) in a basement graben feature of the Ontong Java Plateau, a location thought to have protected it from bottom current activity as pelagic sediment accumulated (Kroenke et al., 1991). This site was chosen because it is located in international waters, drilling had been previously approved by the safety panels for Site 807 and the known lithology was considered suitable for testing all three main drilling/coring methods: Advanced Piston Coring (APC), Extended Core Barrel (XCB), and Rotary Core Barrel (RCB) drilling. In addition, Hole 807C was left with a re-entry cone and ~349 m of casing, which made it ideal for testing the new Wireline Heave Compensator.

After encountering difficulties re-entering Hole 807C, Holes U1330A and U1330B were drilled in 2805 m water depth. Hole U1330A, offset 30 m south of ODP Hole 807C, was drilled to a depth of 103.6 mbsf without coring using a RCB assembly with a wash barrel (1W) in place. Two RCB cores (2R and 3R) were then cut from 103.6 to 122.8 m recovering 84.2% of the formation penetrated. A RCB center bit was then used to deepen the hole to a depth of 553.8 m for evaluation of the wireline heave compensator and logging tools. A total of three logging runs were made using the Gamma Ray, Density, Caliper, Downhole Acceleration (HNGS/HLDS/GPIT/DIT-E), the Formation Microscanner (HNGS/GPIT/FMS), and the Gamma Ray, Density, Downhole Acceleration and Magnetic Susceptibility (HNGS/HLDS/GPIT/MSS) tool strings respectively.

Hole U1330B was spudded on 19 February 2009 and was continuously APC cored to a depth of 92.2 m. Ten APC cores were recovered with an overall average recovery of 101-105% except for Core U1330B-4H, which encountered a problem with the core catcher flapper valve resulting in loss of 76% of the core. The new FLEXIT core orientation tool was successfully deployed on all 10 APC cores. The APC temperature tool (APCT3) was successfully deployed on Cores U1330B-5H, 7H, and 9H. Operations ceased at Site U1330B on 20 February 2009 and the ship began its long transit to Honolulu, Hawaii.

The stratigraphic record recovered at Site U1330 can be described as a single lithostratigraphic unit (Unit 1) and consists predominantly of light gray to white nannofossil ooze with foraminifers, locally grading to foraminifer nannofossil ooze. The latter lithology dominates uppermost Core 320T-U1330B-1H, which is noticeably browner in color, most likely a result of higher terrigenous content and, to a smaller degree, the lack of reduction diagenesis, which increased downhole. Traces of siliceous microfossils (radiolarians, silicoflagelates, diatoms) are present. The entire unit is characterized by moderate to slight burrowing with common darker burrow-mottled horizons. Prominent diagenetic features include color banding and burrow halos in shades of green and purple. Locally burrows are partly pyritized, forming hard "bits" in the

otherwise soft ooze. Black burrow features without visible framboidal pyrite in smear slide may contain submicroscopic sulfides such as greigite (see Musgrave et al., 1993).

The single unit designation (Unit 1) for Expedition 320T cores is consistent with that of Site 807 (Kroenke et al., 1991) where Unit IA extended from Holocene/Late Pleistocene calcareous ooze at the sediment/water interface to the ooze-chalk transition in Miocene (~10.4 Ma) sediments at 293 mbsf. As at Site 807, pelagic sediment cored at Site U1330 contains very little volcanic and/or terrigenous input particular below 32 mbsf. Sediment was deposited above the lysocline (Kroenke et al., 1991) in a zone of perhaps lower than expected organic carbon content suggesting low surface-water productivity relative to other equatorial sites (Stax and Stein, 1993). The color bands are fairly early diagenetic (redox) features in that they are present ~10 m below the sediment/water interface. According to Lind et al. (1993), the purplish bands reflect the distribution of disseminated fine-grained iron sulfide, whereas the green bands are enriched in Fe- and Al-bearing silicates. The latter may be clays derived from volcanic ash as suggested by Lind et al. (1993), however we saw no evidence for this in smear slides. Furthermore, Kroenke et al. (1993) only noted distinct ash layers at Site 807 below the section cored at Site U1330.

Planktic foraminifers are abundant and generally well-preserved in the upper Neogene of Site U1330. Core-catcher samples from U1330A-2R-CC and -3R-CC yield an early Pliocene age (>4.37 Ma). Recovery from Hole U1330B is continuous lower Pliocene to Pleistocene sequence based on examination of the ten core-catcher samples. Sediment accumulation rates average ~26 m/my during the Pliocene and slowed to ~16 m/my during the Pleistocene.

Magnetic susceptibility (MS), gamma-ray attenuation bulk density (GRA), compressional wave velocity (Vp), and natural gamma-ray activity (NGR) were measured on the whole-core sections. Split-core measurements on the working half of the core included Vp using the P-wave logger (PWS3 - 3 measurement directions in soft sediment), sediment strength with the automated vane shear (AVS) system, and moisture and density (MAD). Values recorded by the various instruments were in good agreement with those measured at Site 807. Bulk density increases from around 1.50 g/cm^3 at the seafloor to 1.60 g/ cm^3 at a depth of 20 m. Between 20 and 92 m, density varies slightly while gradually increasing to 1.65 g/cm^3. Vp is about 1450 m/sec in the first core and then closer to 1420 m/sec at 92 m. Bulk density data from MAD are in agreement with the GRA logger. The split core Vp measurements are slightly higher than the P-wave logger (~1600 m/sec), but still within 1% precision. All data, except NGR, were uploaded to the LIMS database and downloaded to spreadsheet formats for scientific analysis. Whole round logging data were also successfully displayed along side the digital core images in the DescLogik core description application. NGR raw data were successfully uploaded to the LIMS but the processed results were produced offline while automated data reduction software was being developed. Thermal conductivity was not measured. Although the TK04 needle system yielded valid results while measuring thermal conductivity of a standard, it failed to generate values when applied to wet APC cores. This issue will be investigated during the transit.

Geochemical analyses undertaken on cores taken from Holes U1330A and U1330B include alkalinity on interstitial waters (IW), elemental concentrations of IW samples, total carbon (TC) and total organic carbon (TOC), headspace gas compositions and elemental whole rock compositions. For cores from Hole U1330A, two IW and headspace gas samples were taken per core. For cores from Hole U1330B, one IW and headspace gas sample was taken per core. Six whole rock samples were taken from Core U1330A-3R-2 for ICP-AES analyses to determine if the color differences observed in these intervals could be indicative of chemical zonations. Total carbon (TC) and total organic carbon (TOC) content were analyzed using the CHNS analyzer on each core section, except the low recovery Core U1330B-4R and were also determined on the six ICP-AES whole rock samples.

Testing of the Wireline Heave Compensator (WHC) both in pipe and in open hole at U1330A proved successful, and indicated that the new WHC was working as well as the previous system. However, further fine-tuning and testing of the WHC will need to continue over the next few years, to evaluate the system's response under varying heave conditions. Logging data collected at U1330A compare well with data collected from Hole 807A (ODP Leg 130). In particular, resistivity values at both Holes U1330A and 807A consistently show an increase below 300 m wsf, suggesting an increase in sediment competence and/or sedimentation rates. FMS images, based on high-resolution measurements that are sensitive to heave conditions, show excellent agreement of layering and sedimentary features between the two runs. Magnetic susceptibility measurements, made with a new wireline tool (MSS), show good agreement over all three runs of the toolstring, although there is a drift associated with increasing internal tool temperature.

References Cited

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