

## **IODP Expedition 323: Bering Sea Paleoceanography**

### **Week 4 Report (26 July to 2 August 2009)**

2 August 2009

#### **OPERATIONS**

During this week we completed coring operations at Site U1340 (Site BOW-12B) and two out of three holes at Site U1341 (Site BOW-14B) on the Bowers Ridge. Hole U1341B also was successfully logged with the triple combo and FMS tools.

#### **Site U1340 (BOW-12B)**

Holes U1340B and U1340C were offset 350 m east and 300 m south of Hole U1340A, respectively, in an attempt to avoid the slumped sediments encountered in the top portion at Hole U1340A. Unfortunately, we were unsuccessful in finding an undisturbed sediment sequence and both holes were terminated after a few cores were recovered. A fourth hole was cored, Hole U1341D, due to a mistake in the corrected PDR depth at Hole U1341C that resulted in the first core being taken well below mudline and failing to establish a seafloor depth. The total depth reached at Hole U1341B was 53.9 m CSF-A with a recovery of 103% (APC Cores U1340B-1H through 6H). The total depth cored at Hole U1341C was 28.5 m CSF-A (APC Cores U1340C-1H through 3H) with a recovery of 105.3%. The total depth cored at Hole U1341D was 27 m CSF-A (APC Cores U1340D-1H through 3H) with a recovery of 103%. The official APC coring totals for Site U1340 include 83 total cores, 712.3 m penetrated, 648.1 m recovered, for 91% recovery.

#### **Site U1341 (BOW-14B)**

After a 65 nm transit to Site U1341, rig floor operations and Hole U1341A commenced at 2254 hr on July 26<sup>th</sup>. After an uneventful pipe trip to the seafloor the first APC barrel was pressured up and fired and the barrel recovered 3 m of core establishing a seafloor depth of 2150.9 m DSF. APC coring continued through Core U1341A-20H to a depth of 183.5 m CSF-A using non-magnetic coring assemblies and with the FLEXIT orientation tool installed. The non-magnetic coring equipment was changed to the standard APC coring system and coring continued. Coring with the APC system was suspended after Core U1341A-41H, after two successive short, incomplete strokes of the core barrel. Overall sediment recovery for Hole U1341A was 101.6% with 370 m recovered.

Hole U1341B was cored with the APC system and non-magnetic core barrels through Core U1341B-17H (157.2 m CSF-A). The non-magnetic coring equipment was changed to the standard APC coring system and coring continued through Core U1341B-56H establishing a new continuous APC coring record of 458.4 m CSF-A. The XCB coring system was then deployed recovering Cores U1341B-57X through U1341B-71X. The total depth reached in Hole was 602.2 m CSF-A. APC core recovery for Hole U1341B was 102% with 467.64 m of sediment recovered. XCB core recovery for Hole U1341B was 88.3% with 126.9 m recovered. Total core recovery was 98.7% with 594.5 m recovered.

Hole U1340B was successfully wireline logged using the triple combo and the FMS-sonic tool from the bottom of the hole (600 m) and good quality logs were obtained.

Coring of Hole U1341C commenced at 1555 hr on August 1<sup>st</sup>, 20 m east of Hole U1341B. By the end of the week Cores U1341C-1H through 6H were recovered.

## **SCIENCE RESULTS**

The fourth week of Expedition 323 focused on measuring, describing and analyzing cores from Sites U1340 and U1341. Holes U1340B through U1340D were completed at the start of the week. The sediment recovered from these shallow holes was similar to the uppermost sections in Hole U1340A. The sediment consisted of dark greenish gray to olive diatom ooze and diatom silt with variable amounts of sponge spicules, calcareous nannofossils and foraminifers. Laminated intervals occurred in all holes. The soft sediment deformation related to slumping found in the upper section of Hole U1340A was also found the other three holes.

At Site U1341, the sediment recovered from Holes U1341A and U1341B was similar to the material at Site U1340, consisting mainly of dark greenish gray to dark olive to olive diatom ooze, diatom silt and diatom clay. In the upper part of both holes, the sediment contained variable amounts of sponge spicules and calcareous tests (nannofossils, foraminifers). Sponge spicules were also abundant in the central parts of the record. Soft sediment deformation due to slumping was largely confined to the second and third cores of Holes U1341A and U1341B, and was generally much less pronounced than at Site U1340. Laminated intervals were found in the upper sections, while undulating thick lamination to thin bedding of lighter and darker olive-colored sediment occurred in the lower parts of the record. Authigenic carbonate was found as an accessory component in several distinct horizons at Holes U1341A and U1341B, either finely dispersed in the sediment or as (semi-) lithified nodules or layers. Two massive dolostone layers were found in lower sections of the both holes. Dropstones occurred occasionally throughout the record. Bioturbation of the sediments was mostly slight to moderate, and absent in laminated intervals. Drilling disturbance was mostly negligible during APC coring, but a mixed carbonate and basalt gravel repeatedly occurred at the core tops from Core U1341B-25H downhole, most probably related to fall-in of material from overlying sediment layers. Punctures and cracks occurred frequently during XCB drilling, creating slight to moderate sediment disturbance.

All cores from Sites U1340 and U1341 were measured for physical properties (natural gamma, density, magnetic susceptibility, thermal conductivity, P-wave velocity, color reflectance, paleomagnetism, etc) using the ship's laboratory track systems. Data are reported in the site reports.

Siliceous microfossils occur persistently throughout Holes U1341A, U1341B and U1341C, organic walled microfossils are common from about 420 m CSF-A to the top of the hole, and calcareous microfossils are common from about 130 m CSF-A. The age interval recovered at Hole U1341B covers from the Recent to about 4 Ma based on

eleven radiolarian, diatom, silicoflagellate and dinoflagellate biostratigraphic marker events. The age estimates are well supported by our paleomagnetic records. Diatom, radiolarian and dinoflagellate microfossils show large species variations probably related to changes in sea ice and productivity. Calcareous nannofossils, benthic and planktonic foraminifera show similar large variations in abundance probably the result of secondary dissolution related to changes in surface water conditions.

We found the Bruhnes/Matuyama boundary in Cores U1341A-10H and U1341B-9H in Holes U1341A and U1341B, respectively. The Jaramillo Subchron is between Cores U1341A-13H and 15H (107.5-135.0 m CSF-A) and Cores U1341B-12H and -15H (103.7-141.7 m CSF-A). The Olduvai Subchron was identified between Cores U1341B-25H and -28H (218.7 and 256.7 m CSF-A). The top of the Gauss normal polarity Chron (2.58 Ma) is identified in Core U1341A-39H and in Core Hole U1341B-38H

In the geochemistry lab, we carried on analyses of solid-phase and interstitial water samples retrieved from Holes U1341A and U1341B. We determined sulfate, ammonium and hydrogen sulfide concentrations on interstitial water aliquots, as well as analysis of minor element composition, including Si, Sr, Ba, Fe and Mn. Solid-phase measurements included total inorganic carbon (TIC), total organic carbon (TOC) as well as total nitrogen and total sulfur. Microbiological samples were taken at an interval of one per core until APC refusal at Hole U1341A along with samples for headspace methane concentration and fixed for shore-based measurements.

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

During this week, the technical staff was fully engaged processing cores from Sites U1340 and U1341, assisting scientists with their instruments, data processing, and solving equipment and software issues as they arise.

On a time available basis, work continues on the reorganization of the ship's storerooms. The ship's crew has completed the painting of the decks in the Science Stores and staging area. The weekly fire and boat drill was held as scheduled.