

IODP Expedition 346: Asian Monsoon

Week 4 Report (18–24 August 2013)

Operations

This week of IODP Asian Monsoon Expedition 346 we completed coring and logging operations at Sites U1422 and U1423.

Site U1422

The week began as the drill string was deployed to a depth of 3425 mbrf to start coring operations at Site U1422. The top drive was picked up and the pipe was spaced out for spudding Hole U1422A. A precision depth recorder (PDR) reading for the site established a seafloor depth of 3450 mbrf. This was 4.4 m deeper than the depth of 3446 mbrf predicted from precruise site survey data. The bit was placed at 3446 mbrf and Hole U1422A was started at 0340 h on 18 August. The core barrel was recovered full (9.96 m) preventing us from determining an accurate seafloor depth. This ended Hole U1422A. The vessel was offset 15 m north of Hole U1422A and Hole U1422B was started at 0515 h with the bit placed at a depth of 3441 mbrf. Once again, the barrel was recovered full (9.67 m) necessitating a third attempt to establish mudline. The vessel was offset 30 m to the south of Hole U1422B and Hole U1422C was spudded at 0640 h with the bit placed at 3435 mbrf. When recovered, this core barrel contained 4.64 m of core establishing a seafloor depth of 3440.3 mbrf. Coring operations continued in Hole U1422C using full length APC core barrels to 125.3 mbsf, at which point Core U1422C-14H required 90,000 lbs of overpull. This indicated that we would need either to drill over future core barrels or switch to the half-length APC core system. Given the success of the half-length APC core system on the previous expedition (South Alaska Margin Expedition 341), this was the tool of choice. Using this system, Cores U1422C-15H to -31H were recovered to a total depth of 205.2 mbsf. The top drive was set back and the drill string was pulled clear of the seafloor at 1950 h on 19 August, ending Hole U1422C. Total recovery for this hole was 215.8 m (105%). A total of 17 half-length APC cores were recovered from a 79.9 m interval that recovered 86.2 m of core (108%). Four temperature measurements were taken using the APCT3 temperature shoe. Measurements were taken on Cores U1422C-4H, -7H, -10H, and -13H at depths of 33.1, 61.6, 87.3, and 115.8 mbsf, respectively.

The vessel was offset 15 m west of Hole U1422A and Hole U1422D was spudded at 2120 h on 19 August. The bit placed 3 m lower than it was for Hole U1422C at 3438.4 mbrf. The first core recovered contained 8.14 m of sediment, establishing a seafloor depth of 3439.8 mbrf. Cores U1422D-1H to -16H penetrated to 141.8 mbsf and recovered 152.8 m (108%). At that time the co-chief scientists decided that spending further time on the hole would not be fruitful due to the increasing amount of turbidites throughout the lower part of the section. The top drive was set back and the drill string was pulled clear of the seafloor at 1235 h on 20 August, ending Hole U1422D.

The vessel was offset 15 m east of Hole U1422A and Hole U1422E was started at 1320 h on 20 August. A seafloor depth of 3440 mbrf was established with the mudline core. Coring operations

continued in Hole U1422E recovering 14 APC cores to 111.6 mbsf. We used the half-length APC system for Core U1422E-9H and -10H in an attempt to recover a section of the formation where recovery had been problematic in the previous holes. Incomplete stroke on Cores U1422E-13H and U1422E-14H led to the curtailment of coring operations. Total core recovery for this hole was 114.34 m (103%). The top drive was set back and the drill string was pulled clear of the seafloor at 0420 h on 21 August. The drill string was recovered back aboard the vessel, the bottom-hole assembly (BHA) was set back in the derrick, and the vessel was secured for transit. At 1142 h on 21 August the vessel ended operations at Site U1422 (JB-3) and began the transit to Site U1423 (JB-2).

Transit from Site U1422 to Site U1423

The transit to Site U1423 (proposed site JB-2) was very short and the 125 nmi distance was covered uneventfully in 12 h at an average speed of 10.4 kt. The sea passage ended at 2342 h on 21 August 2013. The vessel was maneuvered over the location coordinates, control of the vessel was turned over to dynamic positioning (DP) at 0030 h on 22 August, and a seafloor positioning beacon was deployed at 0215 h on 22 August 2013.

Site U1423

The same three-stand APC/XCB BHA used at the previous site was deployed and the drill string was lowered to 1774 mbrf. After picking up the top drive and spacing out the drill string, an APC core barrel was deployed at 0530 h on 22 August. The bit was positioned at 1784.4 mbrf for the mudline core; however the driller was unable to pressure up the drill string. Suspecting that the shear pins had prematurely failed during deployment, the barrel was recovered back to the rig floor where it was discovered empty and with all shear pins sheared. Therefore, the pins were replaced and the bit was lowered 10 m to 1794.4 mbrf for a second attempt. Hole U1423A then started at 0640 h 22 August. Core U1423A-1H was recovered with 7.26 m of core establishing a sea floor depth of 1796.6 mbrf. APC Cores U1423A-1H to -22H were taken from 0 to 206.6 mbsf and recovered 212.9 m of core (103%). Four temperature measurements were taken using the APCT3 temperature shoe, on Cores U1423-4H, -7H, -10H, and -13H (35.8, 64.3, 92.8, and 111.8 mbsf, respectively). With the top drive left in place, the drill string was pulled clear of the sea floor at 2355 h on 22 August, ending Hole U1423A.

The ship was offset 15 m north of Hole U1423A and the bit was positioned at 1791.4 mbrf. Hole U1423B was spudded at 0050 h on 23 August 2013. Core U1423B-1H was recovered with 4 m of core establishing a sea floor depth of 1797 mbrf. APC Cores U1423B-1H to -28H extended to 249 mbsf and recovered 250 m of core (100%). The recovery amount was negatively impacted because of zero recovery for Core U1423B-18H (151.6 to 158.1 mbsf). This was the result of a space out error on the rig floor, resulting in an inadvertent drilling of hole that was to be cored on the next core. APC overpull (using full length core barrels) varied between 60,000 and 80,000 lbs between 142 and 249 mbsf (Cores U1423B-17H-28H) with the exception of Core U1423-27H (230.1 to 239.6 mbrf) when overpull reached 100,000 lbs. The last core on deck was recovered at 1530 h on 23 August. To prepare for downhole logging, the hole was circulated

clean, the logging tools moved forward to the rig floor, the top drive was set back, and the drill string pulled to a logging depth of 80.0 mbrf. The Triple-combo (paleo) tool string was deployed and recorded spectral gamma ray, caliper, magnetic susceptibility, resistivity and lithologic density logs. The second string consisted of the FMS-Sonic tool string, which recorded resistivity images of the borehole, sonic velocities, and natural gamma ray data over the entire interval. Both logging tool strings were able to reach total hole depth. The logging tools were then rigged down and the drill string was pulled clear of the seafloor at 0515 h on 24 August. This marked the end of Hole U1423B.

The ship was offset 15 m south of Hole U1423A and Hole U1423C was spudded at 0655 h on 24 August. The operations plan for this hole was altered to save time and allow for recovering a few gaps in the stratigraphic record remaining after coring Holes U1423A and U1423B. The hole was drilled without coring (using an XCB center bit) to 114 mbsf. APC coring commenced, recovering six cores interspersed with appropriate drilled intervals to properly space out the core breaks and cover the areas of interest. Hole U1423C was terminated at 180.5 mbsf. After setting back the top drive, the bit cleared the sea floor at 1700 h and was back on the rig floor at 2040 h on 24 August. The positioning beacon was recovered aboard at 1756 h while tripping the drill string. After breaking out the bit and non-magnetic drill collar, the rig floor was secured for transit, thrusters/hydrophones were raised, and the sea passage to Site U1424 (JB-1) began at 2136 h on 24 August.

Science Results

Sites U1422 (proposed site JB-3) and U1423 (proposed site JB-2A) are the northernmost sites of the latitudinal transect and two of the deepest targeted during Expedition 346. Site U1422 is located in the northeastern part of the Sea of Japan/East Sea at a water depth of 3429 m, while Site U1423 is located west of the southernmost tip of the island of Hokkaido at 1785 m. Site U1422 is approximately 40 km southwest of ODP Site 795 and near the northeastern edge of the topographic depression of the Japan Basin. The location of Site U1422 was selected specifically to identify the onset of IRD (ice rafted debris) events in the northern Sea of Japan/East Sea and to reconstruct temporal variations in their intensity and frequency. In combination with Sites U1423 and U1424 (proposed site JB-1A) in the Japan Basin, they will allow us to address the timing of onset of orbital- and millennial-scale variability of the East Asian Winter Monsoon and its relation with variability of Westerly Jet circulation; and to reconstruct the history of the Calcium Compensation Depth (CCD) and deep water ventilation as it is tied to sea ice formation and the intensity of the winter monsoon.

This week we processed 129 sediment cores (1025 m) for physical properties, lithologic description, and geochemical and micropaleontological analyses.

The sedimentary succession recovered at Site U1422 extends from the Pliocene to Holocene and closely follows the lithologic sequence previously identified at ODP Site 795, being dominated by clays, silty clays and diatomaceous clays with minor volcanoclastic material. The section is divided into two major lithologic units (Units I and II), distinguished on the basis of sediment composition. Unit I is further subdivided into two subunits based on the frequency of alternating

dark and light color variations. One of the most striking features of Unit I sediments is the alternating decimeter-scale color banded bedding that characterizes much of the sequence.

As found at the deeper and northernmost Site U1422, the sedimentary succession recovered at Site U1423 also extends from the Pliocene to Holocene and is dominated by clays, silty clays and diatomaceous ooze with discrete foraminifer-bearing clay levels. Volcaniclastic material represents a minor component throughout the sediment succession, except in tephra layers where it is the dominant component. The section also is divided into two major lithologic units (Units I and II), distinguished on the basis of sediment composition, referring particularly to the biosiliceous fraction content. Unit I is further subdivided into two subunits based on the occurrence of alternating dark and light color variations and the intensity of bioturbation. At both sites, the character of the sediment physical properties, including NGR, magnetic susceptibility, color reflectance parameters and density, record the distribution of the various sediment components and lithologies.

Temperature measurements made using the APCT-3 tool at five depths, including the mudline, down to 115.8 mbsf in Hole U1422C showed a geothermal gradient of 134°C/km. The calculated heat flow value using this gradient combined with measured thermal conductivities is 120 mW/m².

We successfully constructed the composite sections and splices for Sites U1422 and U1423 to establish the continuous stratigraphic sequence for each site.

Technical Support and HSE Activities

The technical staff was fully engaged supporting coring and science operations at Sites U1422 and U1423.

Logistics:

- No activities to report.

Laboratory:

- Physical Properties Laboratory:
 - Section Half Imaging Logger (SHIL): Randomly writing zero size TIFF files. Discovered that the LabView provided code for writing TIFF files may be asynchronous allowing the SHIL code to close the buffer before the file writing operation fully completed. The code was updated to open the file and then close after confirming file size is non-zero. No further incidents noted. Backlog of core's missing TIFF files were re-imaged prior to moving to current site.
 - Whole-Round Multisensor Logger (WRMSL) and Special Task Multisensor Logger (STMSL): Ran in parallel operation to optimize core flow at the needed measurement interval.
 - No other track issues to report.
 - An issue with unweighed beakers being used for MAD measurements was resolved.

- Magnetism Laboratory:
 - No issues to report.
- Core Description:
 - No issues to report.
- Underway Geophysics:
 - No issues to report.
- Chemistry Laboratory:
 - Loose valve actuator repaired on GC3.
 - Electrode replaced on titrator.
 - Issue with cation column on Metrohm IC being looked into.
- X-Ray Laboratory:
 - No issues to report.

The following HSE activities took place:

- Weekly fire and boat drill held as scheduled, weekly.