IODP Expedition 375: Hikurangi Subduction Margin

Week 4 Report (25–31 March 2018)

Operations

This week we continued with observatory operations at Site U1518 and installed a reentry system to prepare for deep coring at Site U1520.

Hole U1518H

The week started with drilling in the advanced circulation obviation retrofit kit (ACORK) (10¾ inch) casing in Hole U1518H, which reached a total depth of 427 m at 0715 h on 25 March. The ACORK landed in the reentry cone and was released from the running tool, but it took several attempts to pull the underreamer and bit back into the casing, with the drilling assembly finally becoming free at 1040 h. The subsea camera was recovered so that the remotely operated vehicle (ROV) platform could be deployed.

The platform was assembled around the drill string in the moonpool and released at 1200 h. When the subsea camera was redeployed, it showed that the platform had landed at an angle but would not pose a problem for deploying the ACORK funnel. The subsea camera was retrieved, the funnel was assembled around the drill pipe on the moonpool and released, and the subsea camera was redeployed, showing that the funnel had landed correctly. After the subsea camera was retrieved, we recovered the drill string at 0305 h on 26 March.

Next, we checked the ACORK casing for cuttings and inspected the ROV platform and funnel. A drilling assembly made up with a 9⅞ inch mill tooth bit reached the seafloor at 1015 h. The wellhead was inspected with the subsea camera, showing that the guide base is sitting on a slight slope and the ROV platform is hung up just below the ACORK head. An attempt to bump the platform into position with the bit was unsuccessful and the ACORK funnel was reentered at 1335 h. Upon reentry, the hole was discovered to be nearly full of cuttings. We spent the next ~8 h cleaning the cuttings out of the casing to prepare it for installing a bridge plug. The hole was swept with mud and we recovered the drill bit from the seafloor at 0305 h on 27 March.

A bottom-hole assembly was then made up with a bridge plug to seal the base of the 10¾ inch ACORK casing. Once the drill string reached the seafloor at 1215 h, the subsea camera was deployed and Hole U1518H was reentered at 1400 h. The end of the drill string was positioned at 421 m inside the ACORK casing, and the bridge plug was activated until the bridge plug's packer was set at 1845 h. We recovered the drill string, and the running tool used to install the bridge plug reached the rig floor at 0010 h on 28 March.

In preparation to install the CORK-II stage of the observatory, we had ordered replacement seals to be sent to the vessel. Because we were not able to receive them in time to immediately

commence with CORK-II operations, we moved to Site U1520 (proposed Site HSM-05A) where logging-while-drilling (LWD) data had been collected during Expedition 372. Our plan was to prepare for deep coring at Site U1520 by installing a reentry system and 642 m of casing while waiting for the R/V *Tangaroa* to deliver the CORK-II seals. We started the 12.5 nmi transit to Site U1520 at 0048 h on 28 March.

Hole U1520C

Once we arrived at Site U1520 at 0257 h on 28 March, we started fabricating the base of the reentry cone, which was completed and moved to the moonpool at 0630 h. Then we assembled the hydraulic release tool (HRT) needed to deploy the reentry system and set it in the derrick at 0900 h. Finally, we completed the casing string by assembling and welding together 54 joints of 10¾ inch casing and a casing shoe, and we secured it in the moonpool at 0130 h on 29 March.

Next, we put together a drilling assembly to drill in the reentry system. The drilling assembly was composed of a 9⅞ inch drill bit, an underreamer, and a mud motor to rotate the bit and underreamer in isolation from the casing. The underreamer arms were tested and the drilling assembly was completed and landed inside the casing by 0500 h. The drilling assembly and HRT were then connected to the casing and mud skirt by 0730 h, and the reentry cone was assembled and welded by 1030 h on 29 March.

The moonpool doors were opened and the reentry system was lowered to the seafloor, until the bit reached 3499 m below rig floor at 1730 h. While the reentry system was being lowered to the seafloor, the R/V *Tangaroa* arrived at 1615 h to deliver the seals needed for the CORK-II installation at Site U1518.

The subsea camera was deployed to monitor the reentry cone and base while drilling it into the seafloor. Hole U1520C was started at 1940 h and it took ~27 h for the bit to reach a total depth of 646 m, with the casing shoe at 642 m. Once the drilling system was released from the reentry system at 2230 h on 30 March, we recovered the subsea camera and then the drill string at 1120 h. With the reentry system completed, we departed for Site U1518 at 1310 h on 31 March.

Return to Hole U1518H

We returned to Hole U1518H at 1506 h on 31 March. We spent the rest of this week assembling the CORK-II casing string in preparation for deploying it inside the ACORK that was installed earlier in the week. The 412 m long CORK-II casing string is composed of 29 full joints and a pup joint (342 m) of 4½ inch drill pipe, two ~12 m swellable-packer joints, one ~11 m quadrant-seal joint, four 6¾ inch drill collars (~36 m), and a bull nose.

Science Results

Science activities during the week included finishing the analyses of Site U1518 core data and working on the Site U1518 report for the expedition *Proceedings*. We held science meetings over a three-day period to discuss the Site U1518 scientific results.

Lithostratigraphy

We finalized our core descriptions in close cooperation with the Core-log-seismic Integration and Structural Geology teams and worked on the Site U1518 report.

Biostratigraphy

We collected more samples to refine age determinations and worked on the Site U1518 report. We also completed the preliminary planktonic foraminiferal biostratigraphy of Site U1517.

Paleomagnetism

We completed remaining alternating field demagnetization experiments and the upload of all data. We also worked on the interpretation of section superconducting rock magnetometer (SRM) data, resolving the gyromagnetic overprint and primary magnetic direction of discrete samples, and conducted rock magnetic experiments.

Structural Geology

We finalized our core descriptions in close cooperation with the Core-log-seismic Integration and Lithostratigraphy teams and worked on the Site U1518 report.

Geochemistry

We finalized our analyses and worked on the Site U1518 report.

Physical Properties and Downhole Measurements

We checked the quality of all measured data and worked on the Site U1518 report. Some anomalous grain density values were observed after measuring all the Site U1518 moisture and density (MAD) samples. Detailed examination showed that these anomalous values were associated with dry volume measurements made in Cells 1 and 2 of the pycnometer. The values were corrected based on postmeasurement recalibration using standard spheres. For future measurements, we plan to calibrate more often to keep the deviation of the cells within ±0.5% rather than ±1%.

Core-Log-Seismic Integration

Logging-while-drilling (LWD) data were provided to other laboratory teams for comparison with core data. We created synthetic seismic traces to tie core, log, and seismic data together, and

used them to correlate the log data to the seismic profile. The seismic units defined by the Expedition 372 science party were revised accordingly. Correlations between LWD data (Holes U1518A and U1518B) and core data (Holes U1518E and U1518F) were presented at the science meeting. Finally, an analysis of LWD data from Hole U1520B was used to assist with selecting the location and casing depths for Hole U1520C.

Observatory

Early in the week we refined the handling procedures and detailed deployment plan of the instrument string in Hole U1518H. We made the final top splice of the thermistor string once the exact depth of the osmo package seat in the CORK-II casing string was finalized. Most of the connections between the rope sections, osmo package, weak links, sinker bars, and top plug were completed, and the entire instrument string was laid out on the catwalk in preparation for deployment on 1 April.

Education and Outreach

Live Broadcasts

This week we conducted seven live broadcasts with schools and universities in Japan, New Zealand, and the United States. These reached 343 people, from middle school to university students.

Social Media

We posted photos and videos (see below) on Facebook (https://www.facebook.com/joidesresolution), Twitter (https://twitter.com/TheJR), and Instagram (http://instagram.com/joides_resolution). Facebook statistics show that a total of 18,658 people were reached and we added 25 new followers. Twitter had 3,955 followers and Instagram had 1,071 followers.

Videos

Videos on the Expedition 375 Science Objectives (https://youtu.be/hdCaTaH0-x8), Underreamer testing, and the winning entry by Gisborne student Matthew Proffit on naming Te Matakite were posted on YouTube, Facebook, and in some of the blogs listed below.

Blogs

We posted four blogs to “Ship’s log” (on http://joidesresolution.org): the first entry on a series of blogs on the Site U1518 Observatory (“Te Matakite”), a blog on testing the underreamer, and two guest blogs.

Technical Support and HSE Activities

The following technical support activities took place during Week 4.

Laboratory Activities

- Technical staff measured the Expedition 372 archive-half core sections on the SRM.
- We tested the pycnometer after scientists reported some bias in data from different pycnometer cells. As a result, we developed a more rigorous calibration procedure.
- Technical staff crosstrained on the SRM, MAD station, and the SCORS application.
- Original thermal conductivity (TCON) data were cancelled and reuploaded to the database using the new TCON uploader.
- We added personal storage shelves to the Core Laboratory description area.

Application Support Activities

- We continued work on the Cahn Balance program.
- We modified the Thermal Conductivity (TCON) uploader and LORE report and worked with Assistant Laboratory Officers, the Expedition Project Manager, and a downhole measurements scientist to validate the data and report. The reason for the change was to correct a known issue with how we calculated the average and standard deviation for each set of measurements on a sample.

IT Support Activities

- We worked with TAMU IT to enable email distribution list management.
- We conducted miscellaneous maintenance.

HSE Activities

- The IODP technical staff Marine Emergency Training Squad (METS) participated in a simulated fire drill.
- We held the weekly fire and boat drill as scheduled.
- We tested safety showers and eye wash stations.