IODP Expedition 395E: Complete South Atlantic Transect Reentry Systems

Week 6 Report (9–15 May 2021)

During Week 6 of Expedition 395E, Complete South Atlantic Transect Reentry Systems, we completed casing operations at Hole U1556B. In the remaining ~2.5 d of operational time before starting the transit to Reykjavík, Iceland, we cored Hole U1561A (proposed Site SATL-55A) 13 nmi north of Site U1556.

Operations

Hole U1556B

Week 6 began on 9 May 2021 with operations in progress at Hole U1556B (30°56.5244′S, 26°41.9472′W, proposed Site SATL-53B). Hole U1556A had been cored to basement during Expedition 390C in November 2020, and a reentry system was installed in Hole U1556B during Week 5 of this expedition. The water depth at Hole U1556B was initially assumed to be the same as the mudline depth at Hole U1556B, 5006.4 meters below sea level (mbsl). From midnight to 0200 h, we lowered the cementing bottom-hole assembly (BHA) from 4408 to 4922 mbsl and installed the top drive. The next operation was to deploy the subsea camera to guide reentry into Hole U1556B. However, rough weather with ~4 m heave made it unsafe to launch the camera. Also, at a water depth of 5000 m the camera's umbilical cable has a fatigue operating limit of ~2.5 m of heave. Therefore, we waited for the seas to subside. At 0945 h on 10 May, the seas had calmed enough to deploy the subsea camera. We observed that the top of the reentry cone was level with the seafloor, and tagged it to determine a water depth of 5001.8 mbsl for Hole U1556B. This depth is 4.6 m shallower than the mudline depth at Hole U1556A, which explains why the casing in Hole U1556B landed at a shallower depth than expected. Based on the water depth, the depth of Hole U1556B was revised to 286.2 meters below seafloor (mbsf), with the 10¾ inch casing shoe at 284.2 mbsf. As a result of the shallower-than-expected seafloor, we did not reach the sediment/basement contact.

At 1225 h we reentered Hole U1556B with the cementing BHA. A circulation test showed that the formation had sealed around the casing, hence there was no need to cement the base of the hole. We raised the BHA, which cleared the seafloor at 1240 h and reached the rig floor at 2359 h, ending operations at Hole U1556B.

Having completed reentry installations in Holes U1560B, U1557D, and U1556B for the South Atlantic Transect, some operations time remained before we had to depart for Reykjavík on 14 May. In consultation with the Expedition 390/393 Co-Chief Scientists, it was decided to core a single hole at nearby alternate Site SATL-55A, where the sediment/basement contact was thought to be at ~126 mbsf. We secured the rig floor for transit and raised the thrusters. At 0114 h on 11 May we started the 13 nmi transit north.

Site U1561

We arrived at Site U1561 (30°43.2902′S, 026°41.7162′W, water depth 4909.5 mbsl, proposed Site SATL-55A) at 0324 h on 11 May. We lowered the thrusters and entered dynamic-positioning mode at 0349 h. The advanced piston corer/extended core barrel (APC/XCB) BHA was made up and was lowered to the seafloor. Based on the seafloor reflection in the seismic profile, the water depth at Site U1561 was expected to be 4857 mbsl (Expedition 390/393 *Scientific Prospectus*). As we came on site, the precision depth recorder 3.5 kHz unit malfunctioned and the depth reading had to be taken with the 12.5 kHz unit instead, giving an apparent water depth of 4963 mbsl (106 m deeper than the depth in the *Scientific Prospectus*). Because of this discrepancy, after 4857 mbsf we slowly lowered the drill bit and monitored the weight of the drill string. The drill string took noticeable weight at 4927 mbsl, indicating that the BHA was partly supported by the formation. We raised the drill bit to 4917 mbsl to attempt a mudline core, which returned full, showing that the seafloor was shallower than 4917 mbsl. We raised the drill bit by 5 m to 4912 mbsl for a second attempt, but this core was also full and did not recover a mudline. These two cores were later designated to be Cores U1561B-1H and U1561C-1H, respectively. The drill bit was raised to 4907 mbsl for a third attempt.

Hole U1561A was spudded at 2335 h and Core U1561A-1H recovered 6.7 m, establishing a seafloor depth of 4909.5 mbsl. On 12 May, Cores 2H to 6H advanced from 6.7 to 46.2 mbsf. Core 6H struck basaltic hard rock, which bent the APC cutting shoe. We did not expect to reach hard rock at this depth because the main basement seismic reflector had been interpreted to be at ~126 mbsf at this site. We switched to the XCB and Cores 7X to 9X advanced from 46.2 to 48.9 mbsf. Core 9X took 2 h to advance 1.2 m, recovering 1.18 m. The slow rate of penetration was partly because the BHA was mostly above the seafloor, limiting the weight that could be applied safely. Cores 1H to 9X recovered 45.4 m (93%). At 2245 h we stopped coring to prepare for the transit to Reykjavík. We raised the drill bit, clearing the seafloor at 2355 h, and reaching the rig floor at 1150 h on 13 May, ending operations at Hole U1561A.

From 1230 to 1730 h we deployed the subsea camera to 4881 mbsl, without the drill pipe, to detorque the camera's umbilical cable. This was done because, during the previous deployments on Expedition 395E, the cable had wrapped around the drill pipe up to eight times, and any residual twisting could damage the cable. During this process, the ship was secured for transit. We raised the thrusters, and at 1806 h we began the sea passage to Reykjavík, Iceland. The transit is expected to take ~22 d at a speed of 10.5 kt. By the end of the week, midnight on 15 May, the ship had completed 617 nmi of the total 5761 nmi transit at an average speed of 11.4 kt.

Science Results

Physical property and paleomagnetic measurements were completed on Cores U1561A-1H to 9X. The two cores that were shot from beneath the seafloor, missing the mudline, were also measured on some instruments, but will be used with caution because they likely contain some

push-in sediment. In the Chemistry Laboratory, ion chromatograph, spectrophotometer, and titration measurements were completed on interstitial water samples from Cores 1H to 6H. The unsplit hard rock cores were photographed and put in storage with Expedition 390C and 395E cores.

Outreach

No onboard Outreach Officer is sailing during Expedition 395E. Social media posts were made via the JR Facebook (https://www.facebook.com/joidesresolution) and Twitter (https://twitter.com/TheJR) accounts, run by the JRSO technical staff.

Technical Support and HSE Activities

Laboratory Activities

- Approximately 50 m of sediment were processed in the Core Laboratory. Discrete samples are still being processed in the Chemistry and X-ray Diffraction Laboratories.
- Investigated problems with the level wind that is used to deploy the magnetometer. The limit switches were not activating and the wind was getting jammed. For the starboard side limit switch, we lengthened the bar that triggers the switch by 2 cm, and now it triggers the switch properly. The port side limit switch was disassembled and the internal sensor was found to be facing the wrong direction. The switch was adjusted and reinstalled, and now works. Afterwards, the level wind was used for multiple magnetometer deployments and we had no problems with the system.
- The 3.5 kHz sonar signal was lost completely just before coming onto Site U1561, similar to signal problems on previous expeditions. We tested the 3.5 kHz signal after starting the transit to Iceland, and the transducers appeared to be working, but not consistently. It is unclear what is causing this as the cables in the Underway Geophysics Laboratory are tight and secure after having been repaired. The 3.5 kHz chirp is easily heard on lower decks of the ship.
- Developed an Excel spreadsheet for entering and maintaining pycnometer calibration information, to make it easier for a user to see the historical data and identify possible outliers.
- The superconducting rock magnetometer (SRM) IMS software was extended to write an auxiliary backup file.
- Cleaned and secured the advanced piston corer temperature (APCT-3) tools. Two of the APCT-3 tools will be sent to shore for calibration and battery checks at the end of Expedition 395E.

- Replaced part of the plastic feeding system on the 3D printer after it was found to be damaged. Staff are trying to source a replacement part, but until then the printer may only have one usable print head.

IT Support Activities

- Updated firmware on HP MSL6480 Tape Library tape drive 3 to be the same version as the other tape drives.
- The HP MSL6480 Tape Library tape drive 1 is defective; a replacement unit is being sent to Reykjavík.
- Continued ZENworks 2020 deployment. Bridge, Core Deck, and half of Fo'c's'le Deck completed.
- Worked with Extreme Networks to resolved access to EAC Appliance. EAC provides access to various logfile information for troubleshooting Netsight software.
- Discovered that some Virtual Machines (VMs) were not backing up due to lack of disk space. We removed old backup snapshots to fix the problem.
- All User Room PCs upgraded to Windows 10 v20H2.

Developer Activities

- Catwalk permissions were adjusted to allow access to the template manager.
- The samples of the failed mudline cores were originally entered under project 999 in Sample Master. To fix it, those samples were reentered as Cores U1561B-1H and U1561C-1H and measurements were associated with the correct parent samples.

HSE Activities

- Safety shower and eye wash stations were tested.
- An abandon ship drill was conducted for all personnel.