

## **IODP Expedition 395C: Reykjanes Mantle Convection and Climate: Crustal Objectives**

### **Week 8 Report (25–31 July 2021)**

#### **Operations**

During Week 8 of the International Ocean Discovery Program (IODP) Expedition 395C, Reykjanes Mantle Convection and Climate: Crustal Objectives, we continued operations at Hole U1563B (proposed Site REYK-11A) and began coring at Site U1564 (proposed Site REYK-2A).

#### *Hole U1563B*

The week began with operations at Hole U1563B (60°11.9946'N, 27°59.9996'W). Hole U1563B was advanced without coring to a depth of 301.4 m below seafloor (mbsf). The center bit was retrieved and Cores U1563B-2R to 5R advanced from 301.4 to 325.8 mbsf. The sediment/basement interface was encountered at ~315 mbsf, but was not preserved in Core 3R. While coring Core 5R, the wind increased to sustained speeds of 35 kt, gusting up to 45 kt, causing hazardous conditions on the rig floor, and the vessel began waiting on weather at 0800 h on 25 July 2021. It was noted that there was an unusual noise emanating from a transformer for three of the thrusters. To troubleshoot the issue, the three affected thrusters needed to be shut down. The vessel resumed operations at 1330 h once the wind speeds calmed. Core 5R was recovered and the drill string pulled up to 90 mbsf to work on the thrusters. It was discovered that the insulation around a transformer cable was loose. Once this was repaired, the ship was able to resume operations at 1845 h on 25 July. The crew deployed a wash barrel into the bottom-hole assembly (BHA) and lowered the bit to 325.8 mbsf. After a high-viscosity mud sweep to clean the hole, the wash barrel was retrieved and a core barrel was deployed for Core 6R. Coring continued with Cores 6R to 32R advancing from 325.8 to 456.6 mbsf. Following Core 32R, the crew cleaned the hole with high-viscosity mud due to deteriorating hole conditions. After Core 32R was recovered, the drill pipe became stuck in the hole and unable to rotate, circulate, or move. Coring operations were terminated, and after ~1.5 h the pipe was freed and the drill string was pulled up to a depth of 363.9 mbsf. In total, 44.38 m of core was recovered over a 155.2 m cored interval (28.6%). Coring of the basalts advanced at an average rate of penetration of 3.6 m/h.

The hole was prepared for downhole logging operations with another high-viscosity mud sweep. The rotary shifting tool was deployed to release the drill bit and allow logging tools to exit the drill pipe. The rotary core barrel drill bit was released in the hole at 2325 h on 28 July, and the drill pipe was pulled up to a depth of 87.6 mbsf. The triple combo tool string was assembled and deployed at 0410 h on 29 July. The tool made two passes of the borehole, reaching a depth of 313.9 mbsf. At 0900 h, the triple combo reached the rig floor and was broken down. The second logging tool run was the Versatile Seismic Imager (VSI). At 1045 h, the VSI tool was deployed and the protected species observation protocols began. Whales were sighted in the area, delaying the start of operations. Once it was deemed safe to fire the air guns, the VSI was lowered to three

stations: 283.9, 292.9, and 308.9 mbsf. Only the bottom two stations recorded successful measurements. At 1652 h, the protected species observation watch ended and the tools were pulled out of the hole, reaching the rig floor at 1810 h. After the VSI tool was broken down, the Formation MicroScanner (FMS)-sonic tool string was assembled and deployed at 1935 h. The FMS-sonic tool descended to 311.0 mbsf and recorded resistivity images of the borehole. The tools were pulled up to the rig floor at 2325 h and the day ended while breaking down the FMS-sonic tool string. The crew pulled the drill pipe up with the end of the pipe clearing the seafloor at 0105 h on 30 June and the rotary table at 0513 h. The rig floor was secured, thrusters raised, and the vessel began the 144 nmi sea passage to Site U1564 (proposed Site REYK-2A) at 0518 h on 30 July.

#### *Hole U1564A*

The vessel arrived at Site U1564 at 1748 h on 30 July. The thrusters were lowered, the ship entered dynamic positioning mode, and the drill string with an advanced piston corer/extended core barrel (APC/XCB) BHA was made up. The drill string was run to a depth of 2220.0 mbsf to spud Hole U1564A (59°51.0377'N, 23°16.0071'W), ~20 m west of the site coordinates. The exact site coordinates are to be reserved for future reentry system and casing installation during Expedition 395. Hole U1564A was initiated at 0245 h and Core U1564A-1H recovered a full core (9.89 m), prohibiting the establishment of the seafloor depth.

#### *Hole U1564B*

The ship offset 20 m to the east—directly over the site coordinates—and Hole U1564B (59°51.0372'N, 23°15.9868'W) was spudded at 0342 h on 31 July. Core U1564B-1H recovered 7.22 m of sediment, placing the seafloor at 2207.9 m below sea level (mbsl). Coring continued through Core 3H when the error in the ship's offset was noted and operations at Hole U1564B were terminated. The bit cleared the seafloor at 0630 h, ending Hole U1564B. A total of 26.81 m of core was collected over a 26.2 m cored interval (102% recovery).

#### *Hole U1564C*

The ship was offset 20 m west, over the Hole U1564A coordinates, and Hole U1564C (59°51.0374'N, 23°16.0087'W) was spudded at 0707 h on 31 July. The seafloor depth was calculated at 2208.1 mbsl, based on the recovery of Core U1564C-1H (7.02 m). Coring continued with the APC system recovering Cores 2H–17H (7.0–159.0 mbsf). Core 17H required significant overpull (90,000 lb) to release the core barrel from the sediment. Coring with the full-length APC was terminated and the crew began making up the half-length advanced piston corer (HLAPC) barrels. Cores 1H to 17H recovered 164.9 m of sediment over a 159.0 m interval (104% core recovery).

All APC cores were oriented using the Icefield MI-5 tool. Formation temperature measurements were taken on Cores U1564C-4H, 7H, 10H, 13H, and 15H; however, the third generation advanced piston corer temperature (APCT-3) tool flooded on Core 4H and the data were not collected.

## Science Results

The JRSO technical staff processed the cores and samples in the ship laboratories, following the measurement and sampling plan constructed by the shore-based Expedition 395 Co-Chief Scientists and science party members. Core description, biostratigraphy, and analysis of shipboard data will take place postcruise.

The science party held an operations update and science summary meeting for Site U1563 on 30 July.

### *Hole U1563B*

Cores were run through the whole-round (WR) and section half track systems. The WR core measurements included magnetic susceptibility (MS), gamma ray attenuation bulk density, and natural gamma radiation (NGR). The split cores were imaged and measured for *P*-wave velocity, thermal conductivity, color reflectance, point magnetic susceptibility (MSP), magnetic properties, and X-ray fluorescence using a portable X-ray fluorescence spectrometer. WR rock pieces were routinely collected for postcruise microbiology studies and select core pieces were measured using the superconducting rock magnetometer (SRM). The shore-based petrology group provided intervals for inductively coupled plasma–atomic emission spectroscopy and thin section samples.

Core U1563B-2R contains 0.54 m of carbonate ooze with basalt clasts. Cores 3R to 32R are composed of dark gray basalt with vesicles and calcite veins. The basalts have some brown staining and contain infilled vesicles. Many of the basalt cores contain thin intercalated carbonate beds. Cores 15R and 17R contain carbonate pieces with brecciated clasts of basalt.

The average MS value of the basalt cores is 177 instrument units (IU). Peaks in MS occur in Cores 15R, 17R, and 24R. The cores have low NGR values, with an average of 2 counts/s. The *P*-wave velocity of the basalts is 5500 m/s.

The downhole logging measurements and borehole images are being processed by the Borehole Group at Lamont-Doherty Earth Observatory.

### *Site U1564*

Because of the time constraints imposed by the single day of transit from the last site to port, laboratory measurements were reduced for Site U1564. Cores U1564A-1H, U1564B-1H to 3H, and U1564C-1H to 17H were measured on the WR and section half track systems. Headspace gas samples for safety monitoring and paleontology samples for postcruise biostratigraphy were collected on the catwalk. No other shipboard samples were collected from these cores. The WR core sections were immediately scanned without thermal equilibration on the Whole-Round Multisensor Logger and the Natural Gamma Radiation Logger. After being split, the section halves were imaged and measurements for color reflectance and MSP were collected. Finally,

the section halves were scanned on the SRM at 5 cm resolution using three demagnetization steps.

Cores U1564A-1H, U1564B-1H, and U1564C-1H are composed of clay to silt with brown, gray, and light gray banding. Cores U1564B-2H to 3H and U1564C-2H to 6H are a light gray to gray clay to silt. Within Core U1564C-7H, the sediment transitions from a lighter gray to a dark gray. From Core U1564C-8H to 17H the clay to silt sediment shows gray to dark gray banding. Foraminifers can be seen on the split core surfaces and dropstones are occasionally observed. Methane values are under 3 ppmv.

Formation temperature increases linearly downhole from 8.7°C at 54.5 mbsf to 15.6°C at 140 mbsf.

## Education and Outreach

This week the Education and Outreach effort focused on social media.

### *Social Media Posts*

Social media is spread across three platforms: [Facebook](#), [Twitter](#), and [Instagram](#). The table below summarizes the metrics and impacts of original posts for the past week (retweets not included). This includes impressions, which are the number of times a post has been displayed, and engagements, which includes likes, shares, and comments.

Social media is a collaborative effort, with many of the Expedition 395 science party and Expedition 395C technical staff engaged in posting original content and sharing posts from the *JOIDES Resolution* accounts.

The month of July was another record-setter for the *JOIDES Resolution*'s Twitter account. The tweets this month generated over 600,000 impressions and over 18,000 engagements.

Platform	Number of Posts	Impressions	Engagements
Facebook	10	19,376	1,066
Twitter	25	94,426	2,639
Instagram	4		257 likes

## Technical Support and HSE Activities

The JRSO technical staff were engaged in laboratory and project activities.

### *Laboratory Activities*

- The technical staff received and processed core from Sites U1563 and U1564.
- All sampling and measurements were taken by the technical staff.
- Protected species observation protocols took place during VSI operations at Hole U1563B. All whale sightings were documented.
- The G Gun Parallel Cluster was deployed for VSI operations at Hole U1563B.
- Preparations are underway for the end-of-expedition shipments.
- The technical staff prepared their end-of-expedition reports.

### *IT Support Activities*

- The telemetry from the Schlumberger logging winch is displaying on RigWatch again. The connection had failed and needed to be fixed.
- Spirion was updated on the Mac Minis.
- An issue with WinTemp was resolved.
- The Mac Mini was replaced in the Publications Office.

### *Developer Support Activities*

- The QC Viewer program development continued along with bug fixes. The QC Viewer program was deployed to the onshore test environment for user testing.
- The Catwalk and Sample Master application would not launch, which required assistance.

### *Health and Safety Activities*

- The safety shower and eye wash stations were tested.
- A life boat drill was held on Sunday 25 July.