

IODP Expedition 395: Reykjanes Mantle Convection and Climate

Week 1 Report (12–17 June 2023)

Operations

IODP Expedition 395 began at 0800 h (UTC + 0 h) on 12 June 2023, at NATO Berth 12 in Ponta Delgada, Azores, Portugal. The vessel had been in port since 8 June following Expedition 399. The remaining seven scientists from the expedition disembarked the vessel and port call activities continued with the loading of air freight. The laboratory spaces on the core deck and the Geochemistry Laboratory were closed off for testing and cleaning by a professional asbestos cleaning crew. Cleaning of the spaces began earlier in the port call, during Expedition 399.

On 13 June, the Expedition 395 IODP JRSO technical staff boarded the ship at 0900 h, followed by the science party at 1200 h. The JRSO staff and Siem Offshore crew completed their crossovers, and the Expedition 399 staff disembarked the vessel. The science party moved into their cabins and were given the Life at Sea presentation followed by a basic tour of the ship.

The loading and unloading of freight and shipments continued throughout the day on 13 and 14 June. On 14 June the cleaning of the laboratory spaces for asbestos concluded, and the cleaners collected the final air samples. The science party was introduced to several topics throughout the day, including the expedition's science objectives and planned operations, an introduction to a *JOIDES Resolution* expedition, and an introduction to the ship's computing and network infrastructure. Additionally, they participated in the Siem Offshore safety and JRSO hazard communication presentations. The scientists began connecting to the ship's network and working on methods chapters and site reports from Expedition 395C.

The unloading of freight continued with Expedition 399 third-party equipment, refrigerated sample shipments, the core shipment, and other items. In the afternoon of 15 June, the ship was notified that the air samples collected in the laboratory spaces prior to the start of deep cleaning contained no trace of asbestos. The laboratories were opened and the JRSO technical staff immediately got to work reassembling laboratory equipment and computers. The science party spent the day training and working on expedition reports. Scientists attended overviews of publications as well as outreach activities. Siem Offshore crew members instructed science party members on how to put on immersion suits.

On 16 June, the final member of the science party boarded the vessel in the morning, and the Expedition 399 frozen shipments were picked up by the shipping agent. At 1333 h, the tugboats were secured to the vessel, and the last line from shore was away at 1354 h. The pilot disembarked at 1404 h, and at 1418 h the vessel began the sea passage to Site U1564 (proposed Site REYK-02A). The ship completed 114 nmi of the 1350 nmi transit at an average speed of 9.7 kt. The science party learned about IODP depth scales and how to access data on the ship.

The remainder of the day was spent enjoying the departure from Ponta Delgada and working on expedition reports. Following a three-year delay, Expedition 395 was underway.

The science party participated in laboratory safety tours and was introduced to IODP curation on 17 June. The remainder of the day was spent working on expedition reports and starting to work in the laboratory spaces.

At the end of the week, the ship had completed 386 nmi of the 1350 nmi transit to Site U1564. The vessel is scheduled to arrive on site on 21 June. COVID-19 mitigation protocols were in place all week.

Science Objectives

IODP Expedition 395 will conduct drilling, coring, and downhole wireline logging at four sites along the Reykjanes Ridge in the North Atlantic Ocean and on the eastern margin of Greenland.

The intersection between the Mid-Atlantic Ridge and Iceland hotspot provides a natural laboratory where the composition and dynamics of Earth's upper mantle can be observed. Plume-ridge interaction drives variations in the melting regime, which result in a range of crustal types, including a series of V-shaped ridges (VSRs) and V-shaped troughs (VSTs) south of Iceland. Time-dependent mantle upwelling beneath Iceland dynamically supports regional bathymetry and leads to changes in the height of oceanic gateways, which in turn control the flow of deep water on geologic timescales.

Expedition 395 has three objectives: (1) to test contrasting hypotheses for the formation of VSRs, (2) to understand temporal changes in ocean circulation and explore connections with plume activity, and (3) to reconstruct the evolving chemistry of hydrothermal fluids with increasing crustal age and varying sediment thickness and crustal architecture.

This expedition will recover basaltic samples from crust that is blanketed by sediments and is thus inaccessible by dredging. Major, trace, and isotope geochemistry of basalts will allow us to observe spatial and temporal variations in mantle melting processes. We will test the hypothesis that the Iceland plume thermally pulses on two timescales (5–10 and ~30 Ma), leading to fundamental changes in crustal architecture. This idea will be tested against alternative hypotheses involving propagating rifts and buoyant mantle upwelling.

Millennial-scale paleoclimate records are contained in rapidly accumulated sediments of contourite drifts in this region. The accumulation rate of these sediments is a proxy for ocean current strength, which is moderated by dynamic support of oceanic gateways such as the Greenland–Scotland Ridge. These sediments also provide constraints for climatic events including Pliocene warmth, the onset of Northern Hemisphere glaciation, and abrupt Late Pleistocene climate change. Recovered sediments and basalts will provide a major advance in

our understanding of mantle dynamics and the linked nature of Earth's interior, oceans, and climate.

In 2020 and 2021, Expeditions 384 and 395C completed some of the operations for Expedition 395. Expedition 395C recovered ~2.5 km of core, which was described onshore at the Gulf Coast Repository (GCR) in May 2022. Operations at two of the six primary sites were completed during Expedition 395C (Sites U1555 and U1563) and the vessel will not be returning to these locations during Expedition 395. Four of the five sites with basement targets were cored to ~120 m below the sediment/basement interface. The remaining site, U1564, will be cored into the basaltic basement on Expedition 395.

Outreach

Outreach for Expedition 395 is being led by Jennifer Field of Nipmuc Regional High School in Massachusetts, USA. Over the course of the cruise, there are plans for videos, shore-to-shore video conferences, and blog posts.

This week was spent arriving in Ponta Delgada and getting to know the other people in the science party. Social media posts began before this week on personal accounts and then transitioned to *JOIDES Resolution* accounts. Posts in the *JOIDES Resolution* accounts began on 13 June. A presentation giving an overview of planned outreach activities was given to the science party on 15 June and included an ice breaker activity.

Social Media:

- [Facebook](#) has received two new video posts.
- [Twitter](#) has received new posts with 8,489 impressions and 841 engagements.
- [Instagram](#) has received one post and three reels with a total of 293 impressions.

Ship-to-shore Broadcasts:

- Nine ship-to-shore broadcasts have been scheduled from six different countries, and the first one will be on 26 June.

Expedition Log (blog posts):

- The [expedition log](#) has one new post.
- The [joidesresolution.org](#) page was updated.

Technical Support and HSE Activities

Logistics Activities

- The offgoing shipments from Expedition 399 included:
 - Schlumberger tools added to IODP surface freight.
 - All third-party tools.
 - Core shipment.
 - 400 split core liners for the GCR.
 - Five refrigerated shipments were picked up by World Courier on 15 June.
 - World Courier came with 16 boxes of dry ice, and we offloaded 16 boxes of frozen shipment on 16 June. A few remaining frozen shipments will remain onboard until the vessel docks in Reykjavík.

Laboratory Activities

- Precleaning asbestos air and surface tests results showed no trace of asbestos and the laboratories were cleared to enter around 1430 h on 15 June.
- On 16 June, we started setting up the laboratories and testing the equipment that had been shut down.
- The superconducting rock magnetometer (SRM) was vacuumed down, completed on 19 June.
- Hitachi scanning electron microscope (SEM) software requires a Window 7 product key to open. A workaround is being investigated.
- The physical properties Gantry configure file was corrupted. A restore of the configure file resolved the issue.
- During the calibration process, the RGB integration ratio went over the total integration ratio and resulted in all black images.
- Image capture is not working on one of the computers in Microscope Laboratory; troubleshooting continues.
- An issue was reported that solenoid #1 for the G gun firing box was not communicating from Fantail to the Telemetry Laboratory.
- The Koach bench and hard-shell Coy chambers are being set up for the microbiologist.

IT Support Activities

- Helped with onboarding of staff and scientists.
- Created email distribution lists for scientists.
- Changed weekly backup tapes.

Developer Activities

- Completed database account configuration.
- Completed the transfer of Expedition 384 and 395C data into shipboard production database.
- Assisted in the reattachment of instrument hosts to their equipment.
- Participated in various debugging sessions accrued from instrument host reattachment.
- Updating information in a test hole caused IRIS to move from Expedition 395 to Expedition 399.

HSE

- Emergency shower and eyewash stations were tested.
- Daily COVID-19 tests were scheduled and conducted.
- A lifeboat and fire drill was held on 17 June at 1030 h.