

IODP Expedition 397T: Transit and Return to Walvis Ridge Hotspot

Week 1 Report (10–17 September 2022)

Operations

Expedition 397T began on 10 September 2022 at 0800 h (UTC + 2 h) with the ship tied up at Duncan Dock E, Cape Town, South Africa. All oncoming Expedition 397T personnel, including 22 JRSO staff and eight scientists, moved onto the ship following a 4-day hotel quarantine. The quarantine included a PCR and an antigen test according to the COVID-19 mitigation protocol. All personnel tested negative. Once aboard, all shipboard personnel received another COVID-19 PCR test, and all were negative. Port call activities continued, including the loading of 500 mt of fuel and fresh food. COVID mitigation protocols continued to be followed. One more JRSO staff member came on board before the pilot boarded and the ship departed Cape Town on 12 September at 1018 h.

At 0200 h on 15 September, the ship's clock was set back one hour to UTC + 1 h. We completed the 810 nmi voyage from Cape Town and arrived at Site U1584 (proposed Site GT-06A) at 0830 h. The thrusters were deployed and a drill string with a rotary core barrel (RCB) bottom-hole assembly (BHA) and a C-4 coring bit was assembled. At 1630 h the top drive was engaged and a "pig" was deployed to clear potential rust and other obstructions from the drill pipe. We estimated the seafloor at 2313 meters below rig floor (mbrf) based on the corrected precision depth recorder (PDR) signal. At 1800 h the first core barrel was dropped from 2310 mbrf and the liner returned empty. The driller had observed a tag at 2315.9 mbrf while lowering the core barrel. For the second attempt, the barrel was dropped from 2315.9 mbrf. The liner returned empty again except for sediment residue smeared all along its length, indicating that the barrel had penetrated the formation but couldn't hold the sediment. At 2005 h we declared the seafloor depth at 2315.9 mbrf and deployed the core barrel. The barrel with center bit had to be deployed twice because no indication of landing was detected the first time. We started to drill down without coring, reaching the target at 141.8 meters below seafloor (mbsf) at 0515 h on 16 September. The wash barrel was retrieved and the RCB core barrel was deployed. RCB coring proceeded from Core U1584A-3R through 9R (141.8 to 208.2 mbsf), with core recovery ranging from 0% to 95% (average 36%). The hole was swept with 30 barrels of sepiolite mud after Cores 5R (170 mbsf) and 9R (208.2 mbsf).

At 2215 h on 16 September, we decided to terminate operations at Site U1584 because the seismic basement reflector turned out to be the top of a potentially thick succession of volcanoclastic sediments rather than the desired basaltic lava flows. We retrieved the drill string from Hole U1584A, with the bit clearing the rig floor at 0605 h on 17 September. The rig floor was secured, the thrusters were raised, and we departed Site U1584 at 0700 h. We completed the 111 nmi transit to Site U1585 (proposed Site TT-04A) at a speed of 11.4 kt and arrived at 1615 h. Dynamic positioning (DP) mode was established and we were ready for operations at

1650 h. A bit and bit sub were made up to the RCB BHA, which was deployed to 3416.4 mbrf by midnight.

COVID-19 mitigation protocols continued to be followed with mask wearing, social distancing, and antigen testing of all personnel. Four individuals tested positive after boarding the ship on 11, 13 (2), and 15 September, respectively. They are being quarantined until antigen tests on 2 successive days, starting on day 5, are negative.

Science Results

Expedition 397T was granted a short time for drilling in an effort to core two sites that were dropped from the Expedition 391 program owing to reduced operations time caused by COVID mitigation. These two sites were part of a 3-hole transect located southwest of the point where Walvis Ridge splits into three chains of seamounts and ridges. Expedition 391 cored the central chain (Center track) at Site U1578. Expedition 397T aims to core the chains on either side, the Tristan and Gough tracks. The primary objective of the transect is to examine geochemical and isotopic signatures of basalts from these seamounts to better understand why these data diverge into 2–3 different types at the same place that Walvis Ridge splits. Relatively fresh basalts, which can only be obtained by drilling, are required to do this research. Such samples will further other Expedition 391 science goals, which are to determine the paleolatitude of the hotspot and to better understand the volcanological formation of the seamounts.

The Expedition 397T science party consists of eight members of the larger Expedition 391 science party (project team) and the JRSO Expedition Project Manager. Two scientists who did not sail on Expedition 391 received required laboratory safety training. The scientists and JRSO technicians held a virtual kickoff meeting during the hotel quarantine, where they received a science overview from the Co-Chief Scientist, and discussed shipboard measurements, sampling strategies, and outreach plans. During the voyage to Site U1584, all scientists and JRSO key personnel attended the pre-spud meeting to review planned operations at proposed Site GT-06A, as well as a series of planning meetings to clarify shipboard laboratory measurement objectives and sampling strategies.

The shipboard analytical work will stretch out over the coming weeks and is also limited to some degree by the small science party. All science data acquired during Expedition 397T will be posted for the remainder of the Expedition 391 science party so they can select samples for personal research.

Site U1584 Preliminary Results

Cores U1584A-3R to 5R consist of bioturbated clay to fine sand size material, ranging from tan mud in Core 3R to gray sandy mud in Core 4R and reddish-brown sandy mud in Core 5R. Based on the abundance of black opaque and lithic grains, particularly in Cores 5R and 6R, the bulk of this material is of volcanic origin. Core 6R was lost in the coring process and had no recovery.

Cores 7R through 10R consist of polymict volcanic breccia-conglomerate or lapillistone with mostly fine pebble-size (lapilli) clasts, occasional large pebble-size basalt clasts, and conspicuous black mineral grains in the sandy matrix.

Although the material cored in Hole U1584A will be valuable for studies of Walvis Ridge seamount volcanology, drilling was abandoned early because scientists thought that the material was unlikely to be suitable for the primary science objectives. The basalt clasts are few, mostly small, and likely highly altered because they have been in a porous matrix. Fresh basalt is required to achieve acceptable geochemical and geochronological results. Moreover, basalt clasts with random orientations are useless for determining paleolatitude. The site survey seismic section showed a smooth “acoustic basement” reflector, which we interpret as the top of the breccia or lapillistone. Unfortunately, no deeper reflector that might indicate the top of lava flows is apparent. Not knowing how far in depth the volcanoclastics extend, the science party decided to stop drilling at Site U1584. The basement reflector in the site survey data does not indicate a more promising location on the guyot, and contingency time for a second hole near this location was not available, so we decided to use the saved time at the next planned site.

Outreach

Expedition 397T education and outreach activities were limited due to the Onboard Outreach Officer testing positive for COVID-19. For this reason, no live ship-to-shore broadcast events took place. Fifteen posts were made to [Twitter](#), leading to 22,381 impressions, 1,067 engagements, 409 likes, 81 retweets, and 13 replies. The Twitter account gained 34 new followers. Thirteen posts were made to [Facebook](#), reaching 20,115 people and leading to 1,702 engagements, 661 reactions, 31 comments, and 25 shares. The Facebook page gained 5 new followers. Seventeen posts were made to [Instagram](#), reaching a total of 9,089 people and leading to 10,594 impressions, 732 engagements, 713 likes, 15 comments, 11 shares, and eight saves. The Instagram account gained 1 new follower. Three blog posts were published to the [JOIDES Resolution website](#), including one written by an Expedition 397T scientist.

Technical Support and HSE Activities

Logistics Activities

- Prepared and opened the IODP Stores.

Laboratory Activities

- Supported the reduced science party in preparing and conducting routine laboratory measurements.
- The superconducting rock magnetometer (SRM) service call during Expedition 397P has resolved the noise issue.

- The SRM start protocol was updated.
- Made progress on the scanning electron microscope—energy dispersive X-ray spectroscopy (SEM-EDS) installation in the microscope laboratory, including the anti-vibration mount and arrangement and connection of all instrument components (SEM, control unit, EDS, vacuum pump, air compressor). Currently awaiting EDS software download from the manufacturer.

Application Support Activities

- IRIS Software: Working through numerous bug issues, making progress.
- GEODESC development, testing, and repair, catalog content work, and deployment activities continued.

IT Support Activities

- A few of the newly installed HP Desktops were becoming unresponsive to the point that they had to be powered off and turned back on manually. Reason is unknown at this time and only few machines are affected.

HSE Activities

- The safety shower and eye wash stations were tested.
- A lifeboat safety drill was held on 13 September.
- Conducted daily COVID antigen tests for staff and scientists.