

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

Week 2 Report (18–24 September 2022)

Operations

Week 2 began while lowering the drill string at Site U1585 from 3416.4 meters below rig floor (mbrf) to just above the seafloor based on the precision depth recorder (PDR) signal. We picked up the top drive, pumped the “pig” to clear the newly installed pipe from potential rust and other obstructions, dropped the rotary core barrel (RCB), and began to spud Hole U1585A. The first attempt advanced from 3450.0 to 3459.7 mbrf. No tag was observed, and the barrel returned empty. On the second attempt, from 3459.7 to 3469.4 mbrf, the driller observed a tag at 3468.5 mbrf. The barrel again returned empty; however, it showed evidence of contact in the coring shoe. At 0340 h on 18 September, we declared the seafloor depth at 3468.5 mbrf (3457.3 meters below sea level [mbsl]). At 0430 h a wash barrel was dropped, followed by a center bit, and we drilled ahead to 144.1 mbsf. The wash barrel and center bit were retrieved and a 30-barrel sepiolite mud sweep was conducted. At 1815 h, the core barrel was dropped and coring began with Core U1585A-3R. The driller noted a hard tag at 250 mbsf, followed by a drilling break at 262 mbsf. This corresponded to the penetration of a massive basalt breccia layer. Hard rock drilling rates were encountered from Core 31R on downwards, corresponding to the penetration of massive basalt. The last core, Core 39R, was retrieved in the morning of 23 September, reaching a total penetration of 498.8 mbsf. In Hole U1585A, we recovered a total of 217.7 m of sediment and rock for a 354.7 m interval cored, with recovery ranging from 11% to 103% (average 61%). The hole was swept with 30–40 barrels of sepiolite mud after every one to three cores.

At 0615 h on 23 September, we began retrieving the drill string and the bit cleared the rig floor at 1555 h, ending Hole U1585A. The drill floor was secured, the thrusters raised, and the voyage to Lisbon, Portugal began at 1715 h. By midnight we had completed 77 nmi of the 4458 nmi voyage.

COVID-19 mitigation protocols were followed with mask wearing, social distancing, and antigen testing of all personnel for the six days that started after the last recorded positive case on board was quarantined, as mandated by the COPE protocol. As of midnight on 21 September, daily COVID testing ended and wearing of masks was no longer mandatory. On 24 September, the last of four infected personnel was released from quarantine.

Science Results

During this second week, we drilled and cored a 499 m thick section at Hole U1585A. The level of shipboard description and analysis we were able to conduct was limited by a very small

science party. The next two weeks of transit to Lisbon will allow us to catch up and provide more information in the site summaries.

Most routine shipboard measurements were carried out with the formidable help of the technical support staff. Whole-round core logging included the measurement of gamma ray attenuation bulk density, pass-through magnetic susceptibility, and natural gamma radiation. The whole-round section surfaces of igneous rocks and some breccias were also imaged in four quadrants. After splitting, the section halves were imaged and measured with the superconducting rock magnetometer (SRM), the diffuse color spectrophotometer, and a point-susceptibility meter. Discrete samples were tested with the spinner magnetometer and measured for moisture and density (MAD) and *P*-wave velocity. The archive section halves were tentatively described as reported below, with a more rigorous description to be carried out in the coming week.

Core U1585A-3R and the upper 4 m of Core 4R consist of bioturbated tan chalk. The lower part of Core 4R through the upper part of Core 7R consists of massive lapillistone with coarse ash tuff matrix, and a few fine-ash tuff layers that in some cases are laminated. From the lower part of Core 7R through Core 11R, the lapillistone layers grade into tuff layers that are typically finely laminated and often display ripples and cross-bedding, forming fining-upward sequences on the order of a meter thick. Cores 9R and 10R have ~2 m thick light tan, chalky layers with nanofossils. From Core 11R through 13R, volcanic breccia with basalt and tuff rip-up clasts, and lapilli/tuff matrix becomes more prevalent. Core 14R with a top depth of 249 mbsf, which corresponds to the driller's observation of a hard tag, and the upper part of Core 15R contain a ~6 m thick, massive basalt breccia unit with green tuff matrix in the lower part and red matrix in the upper part. We tentatively interpret this unit as a hyaloclastite grading upwards into mass-wasted breccia. Below that interval, Cores 15R through 22R consist mostly of gray, light and dark grayish-brown, dark greenish-gray, and bluish-gray fine-grained sediment that is variably calcareous, and displays dark-light cycles with smooth color transitions and recrystallized microfossils in the lightest intervals. Some intervals have a homogenous and featureless appearance whereas others are pervasively mottled as a result of bioturbation in the variegated sediments. These pelagic sediments have a few intervals with small-scale faults and in situ breccia, and are interlayered with a 1.4 m thick volcanic breccia unit in Cores 18R–19R and several thin volcanic breccia layers in Core 21R. Cores 23R through the upper half of Core 31R consist of alternating dark green, greenish-gray, reddish-brown, and dark brown intervals of centimeter- to several decimeter-thick basaltic breccia-conglomerate, laminated sand (coarse ash) layers, and fine-grained (silt-clay, fine ash) intervals. The redder the sediment, the more severely altered the clasts. The fine-grained intervals typically are mottled and fossiliferous, whereby the fossil fragments are severely recrystallized or altered to clay. The succession is tentatively interpreted as a series of mass-wasting deposits.

At ~408 mbsf (Core 31R), and through Core 39R, we penetrated and recovered ~90 m of sparsely to highly phytic basalt with varying proportions of pyroxene, plagioclase, and rare olivine phenocrysts. The interval is interpreted as one or more massive lava flows.

A thin chilled margin is present at the top of the basalt, and veins and vesicles are present in various concentrations.

The plan for the small science party on board is to use the next two weeks underway to Lisbon to complete all shipboard measurements, refine core descriptions, share all shipboard data with the full Expedition 391 project team, write site reports, and negotiate and extract samples from Hole U1584A and U1585A cores for shore-based studies by the project team.

Outreach

Expedition 397T education and outreach activities continued into Week 2. One live ship-to-shore broadcast event took place, to an audience of about 25 people in Baltimore, MD. Fourteen posts were made to [Twitter](#), leading to 22,006 impressions, 1,121 engagements, 375 likes, 117 retweets, and 3 replies. The Twitter account gained 26 new followers. Ten posts were made to [Facebook](#), reaching 14,635 people and leading to 963 engagements, 400 reactions, eight comments, and 10 shares. The Facebook page gained five new followers. Seventeen posts were made to [Instagram](#), reaching a total of 6,156 people and leading to 6,172 impressions, 447 engagements, 443 likes, five comments, four shares, and four saves. The Instagram account gained five new followers. Two blog posts were published to the [JOIDES Resolution website](#).

Technical Support and HSE Activities

Laboratory Activities

- Successfully installed the energy dispersive X-ray spectroscopy (EDS) software on scanning electron microscope (SEM) computer. We are currently working with the vendor on an issue with our EDS software license.
- Conducted initial testing of SEM. The instrument is hooked up to an uninterruptible power supply (UPS) and does not show negative effects from fluctuating power during coring operations. The anti-vibration mounting system seems effective at decreasing image deterioration due to vibration (high frequency noise). Compared to the Hitachi, the SEC instrument is showing greater levels of image deterioration due to negative sea conditions. At current performance, imaging of nanofossils will not be possible, except under the calmest sea states.
- IRIS rig instrumentation software testing continued. Drilling interface tests were successful. Verified that data and events broadcast are being received by the IRIS Collector program and loaded into the Operations database. Verified that real-time data is being archived by ORACLE. Currently working on event data archiving and updating user interfaces with feedback from users.

Other Application Support Activities

- GEODESC development, testing, and repair, catalog content work, and deployment activities continued. Worked with shore paleontologist to establish validation rules for taxa and synonyms to ensure integrity of taxa.
- Worked with staff members on shore to begin defining requirements for a hyperspectral camera system.

IT Support Activities

- Continued to migrate existing local user profiles to Active Directory user profiles.
- The laser engraver experienced a system crash during operations due to high computing resource usage by programs installed. The ZENworks Agent and nonessential programs were removed to help reduce the computing resource usage.

HSE Activities

- Preparing hazardous materials for offloading in Lisbon.
- Testing corncob absorbent for solvent hazardous waste.
- Conducted daily COVID antigen tests for staff and scientists until 21 September.