**IODP Expedition 361: Southern African Climates**

**Week 7 Report (7–13 March 2016)**

## Operations

After an 1888 nmi transit from Site U1475, the vessel arrived at Site U1476 (proposed site MZC-01C) at 0048 h on 8 March. The thrusters were lowered and a seafloor positioning beacon was deployed at 0216 h. The APC/XCB bottom-hole assembly (BHA) and drill string were made up and deployed. The drill string was tripped to 2155 mbsl for the first core. The first APC core was filled with water and the bit was lowered 7 m for a second attempt. Hole U1476A began at 0935 h and a 5.72 m core was retrieved (U1476A-1H). Seafloor was calculated at 2165.7 mbsl. Cores U1476A-1H to 24H (0–224.2 mbsf) were taken with 104% core recovery and Hole U1476A was terminated after reaching APC refusal depth at 224.2 mbsf. The drill string was pulled out of the hole with the bit clearing the seafloor at 0705 h on 9 March.

The vessel was offset 20 m north of Hole U1476A and Hole U1476B began at 0815 h on 9 March. Seafloor was calculated at 2166.5 mbsl based on the recovery of Core U1476B-1H. Cores U1476B-1H to 16H penetrated from the seafloor to 148.4 m mbsf and recovered 154.42 m of sediment (104%). Interstitial water whole rounds were taken from every core section in Hole U1476B for postcruise research. The drill string was pulled from the hole and operations in Hole U1476B ended when the bit cleared seafloor at 2115 h on 9 March.

The vessel was moved 20 m east of Hole U1476A, and before starting Hole U1476C the core line was reheaded. Hole U1476C began at 2225 h on 9 March and Core U1476C-1H recovered 5.72 m of sediment. The stratigraphic correlation specialists determined that the coring gaps were aligned with those in previous holes and operations in Hole U1476C ended at 2245 h.

Hole U1476D began at 2330 h with a 1.0 m drilled interval (U1476D-11) to offset coring gaps between holes. Cores U1476D-2H to 25H penetrated from 1.0 to 229.0 mbsf and recovered 237.02 m (103% recovery). After the last core was recovered, the drill string was pulled from the hole with the bit clearing the seafloor at 2015 h on 10 March.

The vessel was offset 20 m south of Hole U1476A and Hole U1475E began at 2125 h on 10 March. Cores U1476E-1H to 25H (0–234.8 mbsf) recovered 243.79 m of sediment (104%). After reaching 234.8 mbsf the drill string was pulled from the hole and the bit cleared the seafloor at 2050 h on 11 March. The positioning beacon was recovered at 0102 h on 12 March. The rig floor was secured for transit at 0335 h and the thrusters were raised at 0349 h. The vessel began the transit to Site U1477 (proposed site ZAM-05A) at 0400 h.

After a 350 nmi transit, the vessel arrived at Site U1477 at 0942 h on 13 March. The thrusters were lowered at 1017 h. The APC/XCB BHA and drill string were made up and the bit was lowered to 412.2 mbsl for the first core. After the first two coring attempts yielded water cores,

the bit was lowered a total of 15 m to 427.2 mbsl for Core U1477A-1H. Hole U1477A began at 1535 h on 13 March and the seafloor depth was calculated to be 429.2 mbsl.

**Science Results**

Cores from Holes U1476A–U1476D were described and two major lithological units were identified. Unit I (0–34.20 mbsf) is composed of light brown to greenish gray foraminifer ooze with nannofossils alternating with foraminifer-rich nannofossil ooze. Unit II (34.20–224.57 mbsf) is composed of greenish gray nannofossil ooze with foraminifers, silt, and clay. Quartz grains are present throughout the cores of all holes, composing between 5% and 20% of the sediment. Green to dark gray mottling and layers of pyrite are common. These features are interpreted as bioturbation and diagenetic alterations, respectively.

Water content, porosity, void ratio, bulk density, dry density, and grain density were measured on 71 samples from Holes U1476A. Whole-Round Multisensor Loggers (WRMSL) were used to measure density, *P*-wave velocity, and magnetic susceptibility (MS) at a resolution of 2.5 cm and natural gamma radiation (NGR) at a resolution of 10 cm for all cores from Site U1476. Thermal conductivity measurements were conducted on 15 cores from Holes U1476A. Half-round measurements of RGB color, color reflectance, and MS were made on all cores. High amplitude cyclic changes in physical properties are observed in the uppermost 17 m at all holes. The cyclic changes continue downward to the bottom of the site with lower amplitude and higher frequency.

Ideal coring conditions and strong variations in whole-round MS measurements allowed for near real-time correlation of holes at Site U1476. A complete stratigraphic splice was achieved to ~243 m composite depth. The splice was constructed using whole-round MS measurements and was checked with the NGR data and blue values from the RGB measurements where available.

Analysis of calcareous nannofossil and planktonic foraminifer biostratigraphy indicates that Hole U1476A spans the Late Pleistocene to the late Miocene. Calcareous microfossils show very good to excellent preservation, with the common occurrence of semi-glassy and translucent planktonic foraminifer specimens. Nannofossil and foraminifer assemblages include tropical to subtropical forms. Calcareous nannofossils are very abundant throughout the whole sequence and reworked Eocene nannofossil taxa are found in very low abundance. Modern tropical diatoms make up a minor portion of the mudline samples and exhibit moderate preservation. Below the mudline sample, diatoms are barren. Sedimentation rates based on biostratigraphic datums are broadly linear at ~3.0 cm/k.y.

Extensive paleomagnetic and rock magnetic data were collected on core material retrieved at Site U1476. All of the section halves and discrete samples were demagnetized. The inclination and intensity data show a strong coring overprint, in particular at the top of the cores. This coring overprint was sufficiently removed in the lower part of each core; however, the upper 1–2 m of

each displays steep inclinations even after demagnetization. After correcting for core orientation, the declination data show intervals scattering around 0° and 180° as would be expected for normal and reversed polarity intervals. Isothermal remanent magnetization (IRM) acquisition experiments were carried out on discrete samples. The rock magnetic data indicate stable concentrations of high-coercivity minerals throughout the core, while the concentration of low-coercivity minerals (e.g., magnetite) is elevated between ~50–125 mbsf and 190–220 mbsf. The trend in low-coercivity minerals parallels volumetric susceptibility measured on discrete samples.

Interstitial water chemistry shows mild early sediment diagenesis at Site U1476. Nitrate and sulfate, two species that disappear with progressively more intense microbial respiration, persist deeper into the sediment column and at higher concentrations than in the previous sites of the expedition. Decreasing concentrations of major elements, such as potassium and sodium, reflect uptake by clay minerals. Methane concentrations remain at or near background levels throughout the cored interval. Carbonate is variable, ranging from 45–75 wt% with terrigenous sediment making up the remainder. The sediment is organic carbon poor, with average concentrations of 0.24 wt% total organic carbon.

## Education and Outreach

*Interactions*

- Ten live broadcasts to: five classrooms in the USA, two classrooms in the UK, two classrooms in Portugal, and one conference of educators; 680 people reached (140 elementary students, 95 high school students, 430 university students, plus 15 educators).

*Social Media*

- *JOIDES Resolution* blog (http://joidesresolution.org/): six posts, 1,021 reads so far.
- Facebook (https://www.facebook.com/joidesresolution): six posts, 4,764 people reached.
- Twitter (https://twitter.com/TheJR): six tweets, ~30–35 retweets, 2,700 followers, 3,398 impressions.
- Instagram (http://instagram.com/joides_resolution): six posts, hundreds of likes.

*Media*

- Expedition 361 webpage (http://joidesresolution.org/node/4384): 1,928 reads to date.
- The *JOIDES Resolution* website was publicized on the Association of Librarians listserv.

**Technical Support and HSE Activities**

*Technical Activities*

- Zebra Printers: The build up of adhesive in the printers continues to be an issue. Placing wax on the guide plate seems to help prevent this build up.

*Computing Activities*

- MUT 15.0.0.1 (data uploader): The new version was installed on the Whole-Round Multisensor Logger (WRMSL) for testing.
- SCORS Downloader: A function to populate drilling disturbances into *Correlator* was developed.

*HSE Activities*

- The weekly lifeboat and fire drill was held on 13 March.