IODP Expedition 361: Southern African Climates

Week 1 Report (30–31 January 2016)

Operations

IODP Expedition 361 began at 1014 h (UTC + 4 h) on 30 January 2016 with the first line ashore at Quay A Mer Rouge in Port Louis, Mauritius. The IODP Staff Scientist and Co-Chief Scientists boarded the vessel at 1100 h, and the offgoing science party departed at 1300 h. Port call activities started with the IODP staff crew change and crossover; offgoing staff departed the vessel at 1500 h. The Siem Offshore crew crossover took place on 31 January and the science party boarded the vessel that morning. The IODP staff began loading the surface freight and food shipments. The vessel is scheduled to depart Port Louis at 0700 h on 4 February.

Science Results

The Expedition 361 science party includes individuals from 10 IODP member countries and 14 nationalities. In addition, an Education and Outreach Officer from the USA is on board to conduct outreach activities.

Week 1 of the expedition consisted of moving onto the ship, a presentation of the scientific objectives given by the Co-Chief Scientists, a life on board presentation, the Captain's safety meeting, and a laboratory safety tour.

Expedition Science Objectives

The Agulhas Current is the strongest western boundary current in the southern hemisphere, transporting some 70 Sv of warm and saline surface waters from the tropical Indian Ocean along the East African margin to the tip of Africa. Exchanges of heat and moisture with the atmosphere influence southern African climates, including individual weather systems such as extratropical cyclone formation in the region and rainfall patterns. Recent ocean model and paleoceanographic data further point at a potential role of the Agulhas Current in controlling the strength and mode of the Atlantic Meridional Overturning Circulation (AMOC) during the late Pleistocene. Spillage of saline Agulhas water into the South Atlantic stimulates buoyancy anomalies that act as a control mechanism on the basin-wide AMOC, with implications for convective activity in the North Atlantic and northern hemisphere climate.

IODP Expedition 361 aims to extend this work to periods of major ocean and climate restructuring during the Plio/Pleistocene to assess the role that the Agulhas Current and ensuing (interocean) marine heat and salt transports have played in shaping the regional- and global-scale ocean and climate developments. The Expedition will core six sites on the southeast African

margin and Indian-Atlantic ocean gateway. The primary sites are located between 380–3040 m water depths.

The specific scientific objectives are:

- To assess the sensitivity of the Agulhas Current to changing climates of the Plio/Pleistocene, in association with transient to long-term changes of high-latitude climates, tropical heat budgets and the monsoon system;
- To reconstruct the dynamics of the Indian-Atlantic gateway circulation during such climate changes, in association with changing wind fields and migrating ocean fronts;
- To examine the connection between Agulhas Leakage and ensuing buoyancy transfer and shifts of the AMOC during major ocean and climate reorganizations during at least the last 5 m.y.;
- To address the impact of Agulhas variability on southern Africa terrestrial climates and, notably, rainfall patterns and river runoff.

Additionally, Expedition 361 will complete an intensive interstitial fluids program at four of the sites aimed at:

- Constraining the temperature, salinity, and density structure of the Last Glacial Maximum (LGM) deep ocean, from the bottom of the ocean to the base of the main thermocline, in order to address the processes that could fill the LGM ocean and control its circulation.

Technical Support and HSE Activities

The IODP technical staff moved aboard the vessel on 30 January and crossed over with the departing staff. We initiated our port call activities and began the distribution of oncoming freight, including assisting the ship's operator with loading food. Introduction and safety meetings were conducted for the oncoming science party.

Miscellaneous Activities

- New conference room chairs were assembled.
- The M-drive motors were installed in the Whole-Round Multisensor Logger (WRMSL) and Special Task Multisensor Logger (STMSL).
- The ship's engineers have started repairs on one of the Geochemistry Laboratory's fume hoods.

Computing Activities

- A test database was created for scientist training.

- The Integrated Measurement System (IMS) software repository was transferred to the ship from shore.
- Shipboard physical properties data from Site U1338 was loaded into the shipboard database to provide practice data for the Stratigraphic Correlators.
- We began testing the instrument drivers for the new cryogenic magnetometer software.
- IMS (9.0) software was installed on the WRMSL and STMSL tracks.

HSE Activities

- The science party and new technical staff completed the ship's operator safety introduction and the IODP Laboratory Safety Tour.