2017-08-21 16:48:16

GeoBremen 2017, 24.9.-29.9.17

Topic: 10. Open Session: Session 10.4: Advances in Scientific Drilling in the Oceans and on the Continents.
Type: Talk
Abstract no.: A-314
Status: submitted

A new seismic stratigraphy for the Plio-/Pleistocene at the Agulhas Plateau related to the variability of sediment provenance in the Indian-Atlantic Ocean gateway

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Content
The exchange of shallow and deep water masses between the Indian Ocean and the Atlantic constitutes an integral inter-ocean link in the global thermohaline circulation. In the gateway south of South Africa long-term changes in deep water flow during the Cenozoic have been initially studied using reflection seismic profiles. But the seismic stratigraphy was poorly constrained and not further resolved within the time period from the late Miocene to present. In particular, there were limited Pliocene records that could be used to investigate the influence of climatic (e.g. Antartic ice volume) and tectonic (e.g. closure of the central American seaway) on the deep-water variability. In 2016 the International Ocean Discovery Program (IODP) Expedition 361 (“SAFARI”) drilled on the southeast African margin and in the Indian-Atlantic ocean gateway [1]. The expedition was mainly targeted to reconstruct the history of the greater Agulhas Current system and recovered complete high-resolution Plio-/Pleistocene sediment sections at six drilling locations. Here we present preliminary results from Site U1475 (Agulhas Plateau), a location proximal to the entrance of North Atlantic Deep Water (NADW) to the Southern Ocean and South Indian Ocean. The site is located over a sediment drift in 2669 m water depth and comprises a complete stratigraphic section of the last ~7 Ma. We show cleaned, edited, and spliced high-resolution data sets of sediment physical properties measured at Site U1475. While the velocity and density records are used to calculate synthetic seismograms for a detailed correlation of the drilling results with the site survey seismic reflection profiles, colour reflectance and natural gamma radiation are interpreted as indicators of biogenic vs. terrigenous sediment input. Preliminary age assignments based on the shipboard bio- and magnetostratigraphy for the most prominent reflectors are ~2.0, ~3.8, and ~5.1 Ma. Furthermore rhythmic bedding within a Pliocene mudwave sequence likely reflects the 100-kyr orbital cycle. While the acoustic parameters are dominated by this 100-kyr eccentricity cycle, colour reflectance and natural gamma radiation show highest variability in the precession band. This very regular response to orbital forcing suggests that the shipboard age model can be significantly improved by cyclostratigraphy.

References:
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