Geophysical Research Abstracts
Vol. 19, EGU2017-11967, 2017
EGU General Assembly 2017

Reconstructing paleoceanographic conditions during the Oligocene/Miocene Boundary using walled dinoflagellate cysts and TEX86: IODP Expedition 318, Wilkes Land, Antarctic margin

Peter Bijl (1), Anja Bruls (1), Julian D. Hartman (1), Francesca Sangiorgi (1), and Francien Peterse (2)

(1) Utrecht University, Marine Palynology and Paleoceanography, Department of Earth Sciences, Faculty of Geosciences, Utrecht, Netherlands (p.k.bijl@uu.nl), (2) Utrecht University, Organic geochemistry, Department of Earth Sciences, Faculty of Geosciences, Utrecht, the Netherlands

Wilkes land is potentially a sensitive sector of the East Antarctic Ice Sheet (EAIS), because Wilkes subglacial basin is largely below sea level. In light of this, understanding changes in ice volume in this sector of Antarctica during past episodes of warmth may help constrain future ice sheet melt in the region. Integrated Ocean Drilling Program Expedition 318 was intended to drill and recover from the Wilkes Land continental Margin to reconstruct the history of the East Antarctic ice sheet (EAIS). The integrated bio-magnetostratigraphic age model for IODP Site U1356 is quite robust for the entire stratigraphic record, but in the Oligocene-Miocene boundary interval, the details of the age model are somewhat elusive. Notably it is uncertain whether sediments dating back to the Mi-1 glaciation event, at the Oligocene-Miocene boundary, are represented in the record.
This research presents a revised age model for the interval around the OMT and gives a paleoceanographic interpretation of Site U1356 based on dinocyst ecology and TEX86 biomarker proxy. The finding of the dinocyst species Edwardsiella sexispinosa provides for an additional dinocyst event, and revised the location of the OMT. Core 45R likely represents the base of the Miocene and Core 46R and Core 47R represents the late Oligocene between ∼23.23 to 25.1 Ma. The dinocyst ecology indicated varying intervals of mostly Protoperidinioid genera to mostly Gonyaulacoid genera, that represent high productivity conditions and oligotrophic conditions respectively. These changing ecological conditions have been related to the a changing upwelling regime along the Wilkes Land margin, which is connected to the polar wind field and positively correlated to the extent of the Antarctic ice sheets. Sea ice conditions are absent along the Wilkes Land margin throughout this part of the record, therefore deep-water formation would also have been reduced. The SST record provided by TEX86 biomarker proxy indicates a decreasing trend towards the Miocene, but does not seem to point consistently to a warmer climate state during the late Oligocene. The dinocyst and TEX86 records seem to infer a smaller than present, dynamic Antarctic ice sheet during the late Oligocene to early Miocene, yet in combination with a quite invariant state of the atmospheric pCO_2 record (Zhang et al., 2013). This seems to indicate a more sensitive Antarctic ice sheet possibly related to a threshold size for a stable ice sheet. However the ice volume changes inferred from the global benthic foraminiferal δ18O record could also have been of a smaller extent. Another cause that could potentially add to the changing δ18O record, is a change in deep water source, more specifically an alternating Southern Ocean deep-water formation which is coupled to the alternating Antarctic cryosphere.