# Late Oligocene-Early Miocene transition: Paleoclimatic and paleoceanogaphic changes linked to a dynamic East Antarctic Ice Sheet, off the Wilkes Land margin.

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## Abstract

Low $\delta^{18}O$ values from deep-sea records during the Late Oligocene were attributed to deep-sea warming and decreased ice volume in Antarctica (e.g. Zachos et al., 2001). However, results from sedimentary records from the Antarctic continental margin indicate gradual Antarctic cooling during the Oligocene and large continental ice sheets on east Antarctica (e.g. Naish et al., 2001.) Resolving this controversy, Pekar et al. (2006) suggested expansion of warmer deep-waters from low latitudes, and reduction of deep-water production near the Antarctic continent. To provide new insights into the relationship between ice-sheet and oceanographic processes on a latitudinal transect across the Polar Front during the Oligocene-Miocene transition (OMT) we studied Late Oligocene- Miocene sediments from DSDP Leg 28 Site 269A (Hayes et al., 1975) and compare them with results from IODP Expedition 318 Site U1356 (Escutia et al., 2011; Salabarnada et al., in prep.) offshore the Wilkes Land margin. We use a combination of indicators in the sediment to help us reconstruct the paleoclimatic and paleoceanographic conditions during the late Oligocene to early Miocene. These include sedimentary facies and ichnological analyses, geochemical (XRF core–scanner) data, magnetic susceptibility, scanning electron microscope (SEM) images, and discrete mineralogical data (XRD). During the Late Oligocene to Early Miocene hemipelagic, downslope and along-slope processes influence the sedimentation in Site 269A. Reworking by bottom-currents is observed throughout the studied record showing changes in their strength and origin. During glacial times, glacimarine deposits are winnowed by bottom currents, with preservation of laminations that contain coarse sand grains indicating increased current velocities. Turbidites and micro-slumps are scarce in this distal site protected from continental input by the Adélie Rift Block and could be linked to the extensive Mass Transport deposition during the Late Oligocene as recorded in U1356 (Escutia et al., 2011, Salabarnada et al., in prep.). Through the record, preservation of calcium carbonate is observed in cemented siltstone beds, and the high Ca-content is linked to the presence of calcareous microfossils (i.e. foraminifera and nannofossils). These cemented beds exhibit low MST values, high Si/Ti ratios associated with the presence of diatoms and radiolarians, and high Mn/Al ratios. All of these indicators point to interglacial periods with well-ventilated and productive waters. Towards the Oligocene-Miocene Boundary (OMB), Site 269A records an increase in Ca-rich intervals likely suggesting a prolonged expansion of warmer waters at this time. Our study on Site 269A and its comparison with Site U1356 suggests a very dynamic East Antarctic Ice sheet with several glacial/interglacial cycles and points to

various intrusion pulses of warmer bottom water from lower latitudes across the Late Oligocene to Early Miocene transition.

***Keywords:*** Late Oligocene; East Antarctic Ice sheet; Oligocene-Miocene Boundary; Palaeoclimate

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