

Variability in microfossil (diatom) assemblages during mid-Pliocene glacial-interglacial cycles determined in Hole U1361A of IODP Expedition 318, Antarctic Wilkes Land Margin

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Abstract

The mid Pliocene (5.3 - 3.6 million years ago [Ma]) was characterised by climatic conditions similar to those expected in the near future. Studying the temporal distribution of Antarctic microfossils from this epoch provides insights into environmental conditions and sea ice configurations during that time, and remains the only way to realistically estimate future phytoplankton community responses and Southern Ocean sea ice extent during anthropogenic climate change. In this study, we characterised and quantified diatoms and silicoflagellates in a sediment core section obtained from the Antarctic Wilkes Land margin (IODP Expedition 318, Hole U1361A), spanning four glacial and interglacial cycles around the Gauss/Gilbert geomagnetic boundary (3.6 Ma) between about 3.69 and 3.56 Ma. Two major microfossil abundance peaks (between 80.16 - 79.26 and 78.86 - 76.66 mbsf; representing time intervals between ~3.66 to 3.64 Ma and 3.61 to 3.57 Ma, respectively) were identified. Both peaks temporally match previously determined high productivity warm intervals (interglacials)^[a]. Microfossil assemblages in these two interglacial periods differed: the abundance peak in the older sediments is dominated by the pennate diatoms *Fragilariopsis barronii*, *Rouxia naviculoides* and *Rouxia antarctica*; indicative of meltwater and stratification. The abundance peak in the younger sediments is composed principally of *Chaetoceros* resting spores, suggesting higher productivity and increased duration of seasonally ice free, open water conditions. Analysing highly abundant microfossils and environmental indicator species^[b] in combination with multivariate statistics, allowed us to categorise each sample as having experienced relatively warm or cold conditions and to refine the age model. Our study provides orbital-scale insights into the variability of Antarctic microfossil assemblages during the mid-Pliocene and is of particular importance to future studies investigating glacial-interglacial phytoplankton community changes of this important time and region.

Keywords: Diatoms; silicoflagellate; sea surface temperature; sea ice.

References

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