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Calcareous nannofossils from the Tasman Sea (IODP Site U1509): biochronology, paleoclimatic evolution and bulk stable isotopes across the Eocene-Oligocene Transition

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About 34 Ma, the Warmhouse climate state switched into the Coolhouse state, when a rapid drop in temperature and the establishment of permanent continental ice-sheet on the Antarctic continent occurred (1).

This event, which is referred to as the Eocene-Oligocene transition (EOT; lasted ~500 ka) represents one of the most prominent transitions of the entire Cenozoic. During the EOT, calcareous nannoplankton experienced significant changes in the assemblage coinciding with the long-term cooling and modifications in the sea-surface water conditions (2, 3), suggesting a cause-effect relationship between the onset of the first sustained Antarctic glaciation and the response of phytoplanktonic communities.

We generated a high-resolution calcareous nannofossil and geochemical datasets ($\delta^{18}O$, $\delta^{13}C$ and % $CaCO_3$) from IODP Site U1509 (New Caledonia Trough) (4) with the final aim to provide an overview of the paleoclimatic and paleoceanographic evolution of the study area across the EOT. Our bio-magnetostratigraphic results, consistent with shipboard data (5), were compared along with other existing records recovered from Indian Ocean, Equatorial Pacific and Atlantic Ocean in order to critically evaluate the reliability, reproducibility and synchroneity of all the biohorizons taken into consideration and to obtain a clearer global perspective.

According to major trends and shifts in the assemblage, the ~5 Myr study interval was subdivided into 4 distinct phases, which were also identified based on changes observed in 1) a number of diversity indices (i.e., species richness, dominance, H-index and evenness), 2) the warm-oligotrophic taxa abundance (*Discoaster saipanensis*, *D. barbadiensis* and *Ericsonia formosa*), 3) the principal component (PC1 and PC2) scores, and 4) bulk stable isotopes and carbonate content. The observed changes are interpreted as an overall decline of warm-oligotrophic

communities and, conversely, the incoming of genera better adapted to cooler and more eutrophic conditions.

The most prominent shift in the assemblage occurred during a time window of ~520 kyr, the precursor phase, with relatively high bulk $\delta^{18}O$ and % $CaCO_3$ values, that predated the phase of maximum glacial expansion (Earliest Oligocene Glacial Maximum – EOGM) (6) and documented the permanent loss of the late Eocene k-selected community, characterized by warm and oligotrophic taxa.

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