Unlocking the mystery of *Clausicoccus subdistichus* across the Eocene–Oligocene transition

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During the Eocene–Oligocene transition (EOT), Earth's climate shifted from a warm, unglaciated state to a cold, glaciated state as large ice sheets developed on Antarctica. At the same time, a sudden increase in the calcareous nannofossil *Clausicoccus subdistichus* is documented in many land sections and deep-sea drilling sites. In addition to the demonstrated value of biostratigraphic events associated with this taxon, questions and uncertainties remain regarding the sensitivity and significance of this taxon in relation to Antarctic glaciation.

Here, we present morphometric and abundance data of the *C. subdistichus* group (i.e., *C. subdistichus* and *C. fenestratus*) from the Indian (Ocean Drilling Program [ODP] Site 756), Pacific (International Ocean Discovery Program [IODP] Site U1509; ODP Site 1209), and Atlantic (Integrated Ocean Drilling Program Site U1411) Oceans. Our data reveal a synchronous increase in abundance (acme event) and size of the *C. subdistichus* group at these sites across the EOT. We interpret this increase as a response to enhanced productivity conditions that were the result of an increase in the northward water transport of nutrients from the Southern Ocean to low and middle latitudes caused by the ice buildup on Antarctica. This hypothesis is further supported by independent proxies, such as opal and benthic foraminiferal accumulation rates, reported from the Southern Ocean and low–middle latitudes, respectively (Diester-Haass & Zahn, 1996: Coxall & Wilson, 2011).

The increase in size of the *C. subdistichus* group is associated with a positive global $\delta^{13}C$ anomaly, which correlates with an oversaturation of $[CO_3^{2-}]$ in seawater that previously was attributed to global shifts in carbonate production and burial (Merico et al., 2008). A partial contradiction arises from the non-standard, high abundance and large cell size observed for *C. subdistichus* across the EOT, which contradicts the typical behavior observed in other nannoplankton taxa (e.g., *Reticulofenestra*) under conditions of high productivity (i.e., high abundance, small size). This discrepancy may be related to the peculiar carbonate geochemistry of the ocean at the onset of Antarctic glaciation.

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