Geophysical Research Abstracts
Vol. 21, EGU2019-16115, 2019
EGU General Assembly 2019

Investigating the Onset of Late Cretaceous Cooling at DSDP Hole 525A Using Calcareous Nannofossils as a Sea-Surface Temperature Proxy

Shamar Chin (1), Nicolas Thibault (2), and David Watkins (3)

(1) Department of Earth and Atmospheric Sciences, University of Nebraska-Lincoln, Lincoln, United States (shamar.chin@huskers.unl.edu), (2) Department of Geosciences and Natural Resource Management, University of Copenhagen, Øster Voldgade 10, 1350 Copenhagen, Denmark (nt@ign.ku.dk), (3) Department of Earth and Atmospheric Sciences, University of Nebraska-Lincoln, Lincoln, United States (dwatkins1@unl.edu)

The late Campanian – Maastrichtian (~74–66 Ma) was characterized by a long-term cooling trend that marks a transition from extreme greenhouse conditions associated with the mid-Cretaceous to cooler conditions that precede the Cenozoic climate. Sparse availability of stable isotope data and the low temporal resolution of biozonations hinder our understanding of this interval, especially for open ocean records. Provincialism of calcareous planktonic taxa also occurred during this time, making it difficult to develop a global biostratigraphic scheme.

Calcareous nannofossils are sensitive indicators of surface water, making this fossil group a useful proxy for understanding Late Cretaceous climatic events and correlating these events across different ocean basins. This study expands on the work of Thibault and Gardin (2007), that explored the paleoclimatic evolution of late Maastrichtian calcareous nannofossils from Deep Sea Drilling Project (DSDP) Hole 525A in the South Atlantic. The completeness of its late Campanian – Maastrichtian record makes Hole 525A an ideal site for this study. Furthermore, high-resolution stable isotope datasets have been published, making this section useful for correlation to other ocean basins.

A total of 72 smear slides from DSDP Hole 525A, spanning approximately 74–66 Ma, were analyzed. Absolute abundances were determined by counting approximately 300 specimens and two additional traverses were scanned for rare species. Given that this is a low middle latitude site, the calcareous nannofossil assemblage is predominantly comprised of cosmopolitan species, with little evidence of provincialism. This means that sea surface temperature changes are not as well expressed at this site. Despite the dominance of cosmopolitan species, abundance increases of "Cool-water indicators" (Ahmuellerella octoradiata, Kamptnerius magnificus and Nephrolithus frequens) are still observed in this section.

In addition to the evidence presented for cool surface water conditions prevailing during the late Maastrichtian (Chron C30N) (Thibault and Gardin, 2007), increases in "Cool-water indicators" are also observed at the base of the early Maastrichtian (Chron C32n1r through the middle of Chron C31r) and two peaks during the late early Maastrichtian (uppermost Chron C31r). These fluxes of "Cool-water indicators" further support onset of global cooling during the late Campanian – early Maastrichtian, evidenced by a rapid, positive oxygen benthic foraminiferal isotope excursion recorded at numerous deep ocean sites.

Traditionally viewed as a low-fertility indicator, the gradual decrease in abundance of Watznaueria barnesiae is observed throughout the section, seemingly following the gradual global cooling trend. Fluctuations in abundance are superimposed on this general decrease. The highest abundances precede the Campanian/Maastrichtian boundary. Increases in abundance also occur throughout the middle Maastrichtian (Chron 31n through Chron 30r), possibly coinciding with the collapse of rudist bivalve-dominated reef systems and the extinction of inoceramid bivalves during the Mid-Maastrichtian event.

References

Thibault, N., & Gardin, S. (2007). The late Maastrichtian nannofossil record of climate change in the South Atlantic DSDP Hole 525A. Marine Micropaleontology, 65(3), 163-184.