

Coccolithophore recovery and diversification across the K-Pg boundary: insights from the Agulhas Plateau (IODP Expedition 392)

O.A. Archontikis^{1,2}, P.R. Bown³, D.K. Kulhanek⁴, J.O. Herrle⁵, J.R. Young³, S.M. Bohaty⁶, G. Uenzelmann-Neben⁷, L.B. Childress⁸, and the IODP Expedition 392 Scientists

1 - Department of Earth Sciences, University of Oxford, South Parks Road, Oxford OX1 3AN, United Kingdom

2 - Department of Earth Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD, UK

3 - Department of Earth Sciences, University College London, Gower Street, London, WC1E 6BT, UK

4 - Institute of Geosciences, Christian-Albrechts-University of Kiel, Ludewig-Meyn-Straße 10-14, 24118 Kiel, Germany

5 - Institute of Geosciences, Goethe-University Frankfurt, Altenhoferallee 1, 60438 Frankfurt am Main, Germany

6 - Institute of Earth Sciences, Heidelberg University, Im Neuenheimer Feld 234-236, 69120 Heidelberg, Germany

7 - Department of Geosciences, Geophysics Section, Alfred Wegener Institute, Helmholtz-Center for Polar and Marine Research, Am Alten Hafen 26, 27568 Bremerhaven, Germany

8 - International Ocean Discovery Program, Texas A&M University, 1000 Discovery Drive, College Station, TX 77845, United States

The Cretaceous-Paleogene (K-Pg) boundary, ~66 million years ago, stands as a pivotal moment in Earth's history, marked by one of the most iconic mass extinction events. The event not only significantly impacted terrestrial ecosystems, but it also had profound impacts on the marine biological pump and the global carbon cycle as evidenced by stable isotope excursions. Calcareous nannoplankton are one of the most prominent groups of primary producers with a key role in sediment formation and a fossil record stretching back 200 million years. The K-Pg event witnessed a severe decline (eradication of c. 90%) in calcareous nannoplankton population with post-extinction incoming lineages being remarkably small (< 3 µm coccolith length) and employing atypical trophic strategies (Gibbs *et al.* 2020). Here, we present data on fossil high latitude coccolithophore demographics across a freshly recovered K-Pg sediment section that was collected from International Ocean Discovery Program (IODP) Site U1579, drilled on the southern Agulhas Plateau during IODP Expedition 392 (Uenzelmann-Neben *et al.* 2023). The K-Pg interval was identified during the expedition by a change in sediment colour and magnetic susceptibility, and diagnostic calcareous nannofossil assemblages. We report on results from analyses on the morphometric traits of the incoming lineages, including those that form a series of acmes (*Praeprinsius*, *Prinsius*, *Toweius*) as a means to understand the tempo of coccolithophore evolutionary dynamics in high latitudes. Supplementing the micropalaeontological datasets, we utilise high-resolution calcareous nannofossil biostratigraphy to provide a refined age model and allow correlations with other currently known nannofossil records. Ultimately, these new data aim to provide valuable insights into the process of Paleocene plankton recovery and diversification in the high latitudes and the establishment of marine ecological niches in the post-mass extinction ocean.

References

Gibbs, S.J., Bown, P.R., Ward, B.A., Alvarez, S.A., Kim, H., Archontikis, O.A., Sauterey B., Poulton, A.J., Wilson, J., Ridgwell, A. (2020) Algal plankton turn to hunting to survive and recover from end-Cretaceous impact darkness, *Science Advances* 6: eabc9123(2020).DOI:[10.1126/sciadv.abc9123](https://doi.org/10.1126/sciadv.abc9123)

Uenzelmann-Neben, G., Bohaty, S.M., Childress, L.B., Archontikis, O.A., Batenburg, S.J., Bijl, P.K., Burkett, A.M., Cawthra, H.C., Chanda, P., Coenen, J.J., Dallanave, E., Davidson, P.C., Doiron, K.E., Geldmacher, J., Güerer, D., Haynes, S.J., Herrle, J.O., Ichiyama, Y., Jana, D., Jones, M.M., Kato, C., Kulhanek, D.K., Li, J., Liu, J., McManus, J., Minakov, A.N., Penman, D.E., Sprain, C.J., Tessin, A.C., Wagner, T., and Westerhold, T., 2023. Expedition 392 summary. In Uenzelmann-Neben, G., Bohaty, S.M., Childress, L.B., and the Expedition 392 Scientists, *Agulhas Plateau Cretaceous Climate*. (2023). Proceedings of the International Ocean Discovery Program, 392: College Station, TX (International Ocean Discovery Program). <https://doi.org/10.14379/iodp.proc.392.101.2023>