Investigating the late Campanian-Maastrichtian cooling trend using clumped isotopes on the coccolith fraction of sediments from the Boreal Chalk Sea and Shatsky Rise

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Our understanding of past climates is reliant upon the use of geochemical proxies. These proxies have been used extensively to interpret past conditions. However, there are uncertainties associated with them. Vital effects often affect the results in that there is a difference between the chemical properties of the biological and inorganic components (Tripati *et al*., 2010). Given these discrepancies, other methods need to be explored, and clumped isotopologues have proven to be a promising paleotemperature proxy. It should also be noted that coccoliths are less susceptible to dissolution than planktic foraminiferal calcite (Schmidt *et al*., 2006), making coccolith-derived sea surface temperatures a viable option for this study.

The late Campanian-Maastrichtian (~74–66Ma) interval of the Boreal Chalk Sea and ODP Leg 198 Site 1210 (Shatsky Rise) is the focus of this study. This interval is of interest because it was characterized by a cooling trend that marked a transition from the extreme greenhouse conditions associated with the mid-Cretaceous. For example, the North Atlantic (~35 °N) cooled by ~7 °C during this time (Linnert *et al*., 2014).

When compared to the North Atlantic, results from other studies show that the cooling trend was less pronounced in other ocean basins, including the Boreal Chalk Sea and Shatsky Rise. It is plausible that the cooling was more pronounced in the North Atlantic due to development of the Gulf Stream. This work is testing this hypothesis by using clumped isotopes on the coccolith fraction of sediments from these two sites. Centrifugation is being used to concentrate the coccoliths into a size fraction ranging from ~4–12μm, and the samples will be analyzed using the SEM to determine the extent of diagenesis. Clumped isotopes will then be used to derive paleotemperatures from the coccolith fraction, and the results will be compared to fully quantitative counts and paleoecological indices.

References

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