

Coccolithophore response to changes in surface water conditions in the North Atlantic (ODP Site 984) during Marine Isotope Stage 5

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In order to reconstruct climatically induced sea-surface water conditions throughout Marine Isotope Stage (MIS) 5, quantitative coccolithophore analyses were performed at ODP Site 984, which is located south of Iceland and close to the modern locations of the Arctic and Polar hydrographic fronts. For this purpose, changes in the coccolith assemblages (e.g., numbers of coccoliths, coccolith accumulation rates, assemblage composition, and diversity), as well as variations in sizes and morphotypes of *Emiliana huxleyi* and *Gephyrocapsa muelleriae*, were investigated.

The observed coccolith assemblages were dominated by *G. muelleriae* and were generally characterized by only a few species. Three intervals of warm surface water expansion were identified that had increased coccolith numbers and elevated species diversities (Interstadials 5e, 5c, and 5a). Decreased numbers of coccoliths and low species diversity indicate an influence of progressive,

cold-water mass expansions into subpolar latitudes, in particular during the last glacial and stadial stages (MIS stages/stadials 6, 5d, 5b, and 4). Differences in the composition of the coccolith assemblages also indicated that the main northward expansion of the warm surface currents occurred during MIS 5e and 5a, with highest coccolith production in stage 5a.

One intriguing result of this research was a significant gradual change in the size of *G. muelleriae* that occurred from the beginning of MIS 5 to MIS 4. In addition, both *E. huxleyi* $>4\mu\text{m}$ and *E. huxleyi* $<4\mu\text{m}$ occurred in higher numbers during intervals of warmer surface waters. Their occurrence, therefore, puts into question the use of this morphotype as a cold-water indicator, at least for pre-MIS 5 intervals. It seems more likely that *E. huxleyi*, as well as *G. muelleriae*, went through various evolutionary adaptations during MIS 5, which may also have led to an exchange in dominance between the two species at the end of MIS 5.