

Dynamics of the surface-water masses in the North Atlantic during the last 20 000 years as revealed by coccolith assemblages

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A coccolith-based micropalaeontological investigation of ODP Sites 980 and 984 from the Feni and Gardar contour drifts of the northern North Atlantic was conducted in order to reconstruct the pattern and timing of surface circulation changes in the area during the last 20 000 years. In addition, sea-surface palaeotemperature records from both sites were generated at high resolution, based on the widely used alkenone palaeothermometer.

The down-core variations in coccolith assemblage composition indicate that changes in properties of surface waters in the northern North Atlantic occurred stepwise during the Termination I. Sparse occurrences of coccolithophores before about 17 000 yrs BP at Site 980 and before about 13 500 yrs BP at Site 984, respectively, indicate harsh environmental conditions and the influence of melt-water. The difference in timing between both sites is due to the position of the Polar Front, which was probably located between the site locations during the interval 17 000 to 13 500 yrs BP. The following stepwise increase of North Atlantic Drift water influence till about 10 000 cal yr BP was associated with the increase in absolute numbers of coccolithophores in the whole area. High coccolith numbers are observed in the early Holocene, which coincide well with maximum Northern Hemisphere summer insolation.

A cooling of the surface waters, as indicated by a prominent change in the relative abundances of the dominant coccolith species, occurred after about 5000 cal yr BP. The numbers of the cold-adapted species *Coccolithus pelagicus* increased considerably. In addition, a successive increase in millennial-scale perturbations of the surface hydrology towards the Neoglaciation (the last *ca.* 5000 years) is documented by changes in accumulation of the species, in particular of *Emiliana huxleyi*. These successive decreases in the numbers of *E. huxleyi*, as previously described by Giraudeau *et al.* (2000), is in phase with recorded Holocene advection of cool, ice-bearing waters from the Greenland-Iceland seas to the North Atlantic. These long-term reorganisations of the surface hydrology are interpreted as the response of the North Atlantic to the combined forces of the solar insolation and the waning Laurentide ice sheet.

Reference

Giraudeau, J., Cremer, M., Manthé, S., Labeyrie, L. & Bond, G. 2000. Coccolith evidence for instabilities in surface circulation south of Iceland during Holocene times. *Earth Planetary Science Letters*, **179**: 257-268.