Geochemical and isotopic signals (Sr/Ca ratios, stable $\delta^{13}C$ and $\delta^{18}O$ isotopes) in coccolith carbonate of different grain-size fractions in Atlantic sediments

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Coccolithophores are unicellular, marine algae and therefore directly dependent on the surface-water conditions in world oceans. They are one of the main open ocean primary producers and one of the dominant carbonate contributors to pelagic sediments (Westbroek *et al*., 1993). Therefore, these organisms influence the chemical composition of surface water by their calcification and photosynthetic mechanisms in different ways. As photosynthetic organisms, their chemistry and stable isotope composition can provide a sensitive tool for understanding photic zone processes (Honjo, 1976). The chemistry of coccoliths serves both as a record of changes in the chemistry of the ocean, and a record of environmental and biological conditions like temperature and productivity (Stoll & Ziveri, 2004). Nevertheless, their effect on, and response to, the climate system is one of the big questions facing our field today, since coccolith geochemistry has hardly been explored.

The studied surface sediment samples from the equatorial to South Atlantic show that the geochemistry and isotopic composition of coccoliths is dependent on coccolith growth rate and environmental influences, such as temperature and nutrient supply. The investigations also indicate a great variability between the different grain size fractions. Even if the absolute values show a great difference, the general trends are similar: the $\delta^{18}O$ ratios in these samples show a decreasing trend with increasing temperature, while $\delta^{13}C$ and Sr/Ca ratios are influenced by a mixture of processes, such as temperature, nutrient- and probably freshwater supply. The knowledge of geochemical and isotopic behaviour of coccoliths is used to reconstruct long-term-changes in paleoceanography and paleoclimate. The coccolith assemblages in ODP Site 659, from the eastern north-eastern Atlantic, show a distinct shift at the Plio-Pleistocene boundary. The reticulofenestrids, which are very abundant in the Pliocene, are replaced by gephyrocapsids in Pleistocene times (Su, 1996). The variation in accumulation rates of coccolith species and variation in benthic $\delta^{18}O$ values have shown climatic instability during the late Pliocene and Pleistocene, where low coccolith fluctuation rates are often parallel to low $\delta^{18}O$ values (Su, 1996). To examine the main influences that caused the shift in faunal association, the geochemical and isotopic parameters in monospecific coccolith carbonate will be measured.

References

Honjo, S. 1976. Coccoliths: Production, transportation and sedimentation. *Marine Micropaleontology*, **1**: 65-79

Stoll, H.M. & Ziveri, P. 2004. Coccolithophorid-based geochemical paleoproxies. *In*: H.R. Thierstein & J. Young (Eds). Coccolithophores - from molecular processes to global impact. Springer, Berlin: 529-562.

Su, X. 1996. Development of late Tertiary and Quaternary coccolith assemblages in the Northeast Atlantic. *Glomar Report*, **48**: 1-119.

Westbroek, P., Brown, C.W., Bleijswijk, J.v., Brownlee, C., Brummer, G.J., Conte, M., Egge, J., Fernandez, E., Jordan, R., Knappertsbusch, M., Stefels, J., Veldhuis, M., van der Wal, P. & Young, J. 1993. A model system approach to biological climate forcing. The example of *Emiliania huxleyi*. *Global and Planetary Change*, **8**(1-2): 27-46.