Size variations of calcareous nannofossils – a good tool for understanding past ocean perturbations?

Lübke, N.[1], Möller, C.[1], Mutterlose, J.[1,*], Bottini, C.[2], Erba, E.[2], Faucher, G.[2]

*1) Institute for Geology, Mineralogy and Geophysics, Ruhr-University Bochum, Bochum, Germany, *E-mail: joerg.mutterlose@rub.de*
2) Department of Earth Sciences, Università degli Studi di Milano, Milan, Italy

Coccolithophores are an important group of marine primary producers. Their sensitivity to the environment and their dominant role among marine phytoplankton make them an essential tool for reconstructing ecological parameters also in the geological record through the study of their fossil remains. Recent biometric studies have shown that dwarfism of certain calcareous nannofossil species in the Cretaceous goes along with significant ecological changes in the marine paleoenvironment. Dwarfism has been specifically described for some intervals of the mid Cretaceous (~125–90 Ma) characterised by perturbation of the C-cycle and profound alteration of the ocean-atmosphere system which resulted in Oceanic Anoxic Events (OAE)s. Some OAEs were strictly related to Large Igneous Province (LIP) volcanic activity which is thought to have induced major environmental perturbations.

Here, we present new calcareous nannofossil morphometric data performed on selected species integrated with published datasets through specific intervals across the Valanginian, Aptian and Albian. The results are discussed in the context of global ocean perturbations related to OAEs and an increased LIPs volcanism. Currently two different hypotheses are discussed to explain size reductions of some nannofossil species across studied OAEs: 1) the “light attenuation” model proposes the disappearance of size-selecting ecological niches in muddy waters due to high atmospheric CO_2 concentrations, a humid climate and enhanced run-off; 2) the “toxic metal” model links dwarfism to the increased input of toxic metals into the oceans, related to hydrothermal activities. Both scenarios ask for an extensive volcanism, documented for the Valanginian (Parana-Etendeka LIP), Aptian (Kerguelen Plateau) and Cenomanian (Caribbean Plateau).