Geophysical Research Abstracts
Vol. 18, EGU2016-5619, 2016
EGU General Assembly 2016

Changes in calcareous nannoplankton calcification during the latest Cenomanian Oceanic Anoxic Event 2 and similarity with other Cretaceous Oceanic Anoxic Events

Giulia Faucher, Elisabetta Erba, and Cinzia Bottini
Department of Earth Sciences "Ardito Desio", Università degli Studi di Milano, Italy

The Cenomanian has been characterized by greenhouse climate conditions and profound environmental perturbations, including the latest Cenomanian Oceanic Anoxic Event 2 (OAE 2), an episode of widespread organic matter burial in oxygen-depleted oceans. OAE 2 is thought to be related to the emplacement of the Caribbean Plateau which probably introduced in the atmosphere a large amount of CO_2 with consequent impact on biota, climate and ocean chemistry. The perturbation of the carbon cycle is reflected in the carbon isotopic record that evidences a positive shift at the OAE 2 onset and subsequent C-isotopic peaks.

The aim of this study is the identification of possible changes in coccolith size/shape as a response to paleoenvironmental perturbations associated with OAE 2. Biometric analyses were performed on selected coccolith species (*Biscutum constans*, *Discorhabdus rotatorius*, *Watznaueria barnesiae* and *Zeugrabdothus erectus)* from five sections spanning the Cenomanian-Turonian boundary interval including OAE 2. The study provided evidence for size fluctuations and dwarfism of *B. constans, Z. erectus* and *D. rotatorius* during OAE 2, followed by a recovery at the end of the event. On the contrary, *W. barnesiae* displays constant sizes through the event. High-resolution investigations showed that *B. constans* follows the same size trends in all the analysed sections with i) a decrease in size at the OAE 2 onset where an increase in pCO$_2$ is observed, *ii)* a partial increase in size back to pre-OAE 2 values around the first δ^{13}C peak (peak A), where a decrease in pCO$_2$ concentration is reconstructed *iii)* and a subsequent more expressed decrease in size reaching minimum values around the δ^{13}C peak B where trace metal abundance has been identified. Small specimens are present till the end of OAE 2 and only after δ^{13}C peak D a partial recovery in size is observed. Nannoplankton dwarfism is here interpreted as forced by rapidly increasing pCO$_2$ during the formation of the Caribbean Plateau. Alternatively, calcification crash might result from a global fertilization of sea surface water or supply of toxic metals, perhaps linked to LIP construction, that might have played a central role in coccolith secretion.

The comparison of our morphometric data with those available for the early Aptian OAE 1a and Albian OAE 1d, pointed out that *B. constans* repeatedly underwent size reduction and temporary dwarfism implying that same paleoenvironmental factors might have controlled calcification during subsequent OAEs. The amplitude of *B. constans* coccolith reduction is different for OAE 1a and OAE 2, but similar minimum values were measured evoking the potential existence of a critical minimum size. Paleoceanographic reconstructions of OAE 1a and OAE 2 hint a correlation between reduced biocalcification and intervals of intense volcanism suggesting that mid-Cretaceous nannoplankton coccolith secretion was related to the amount of CO_2 and/or toxic metal concentrations with a repetitive reduction in size during OAEs, while temperature and nutrient availability do not seem to have been crucial for coccolith calcification. Finally, during OAEs calcareous nannoplankton inability to properly calcify might have facilitated a transient spread of other phytoplankton groups more competitive than coccolithophores.