Calcareous nannofossil assemblages response to the Middle Eocene Climatic Optimum hyperthermal event

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Calcareous nannofossil assemblages show specific paleoecological affinities and thus can be utilized for palenviromental reconstructions. We investigated calcareous nannofossils modifications at the Alano section (NE Italy), during a significant temporary reversal in the middle-late Eocene long-term cooling trend, the Middle Eocene Climatic Optimum (MECO). This warming event is characterized by a prominent perturbation both in oxygen and carbon stable isotopes occurred at Chron C18r-C18n transition (ca. 40 Ma) and lasting ca. 500 – 600 kyr (Bohaty et al., 2009). Our data from the bathial Alano section indicate that the MECO interval seems to coincide with significant changes in calcareous nannofossil assemblages. Eutrophic/cold taxa and reworked specimens show an overall increase in abundance during the warming event. Conversely, oligotrophic/warm taxa are characterized by a peculiar anticovariant trend with respect to meso-eutrophic taxa, decreasing significantly during the MECO and post-MECO intervals. These results are thought to be interpreted as a transient enrichment in dissolved nutrients in warmer sea surface waters and suggests that the enhanced availability of nutrient in the water column overrides other environmental factors in the make-up of calcareous nannofossil assemblage. Morevover, the increase in reworking is consistent with an augment in terrigenous input, likely due to accelerated chemical weathering triggered by the enhanced hydrological cycle. An interesting issue is to investigate if the biotic response to the MECO is global and unique over wide areas and depositional settings or is more related to local conditions. To this purpose we are currently comparing calcareous nannofossils modifications at the Alano section (NE Italy) with those occurred in other MECO reference oceanic sites (U1333 and ODP1051). Our preliminary results from ODP Leg 320 (U1333) in the Pacific Equatorial Ocean, show dramatic changes in preservation state with the number of specimens counted on a specific area (1 mm^2) virtually collapsing during the event. Initial results, although very preliminary, coming from NW Atlantic are also promising. The final step will be to compare all data available in order to obtain a more global perspective on nannoplankton response to the MECO.

References:

Bohaty, S. M. et al. (2009), Paleoceanography, 24, PA2207.