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Change in the earth system and calcareous nannofossil evolution: does any linkage exist? An example from the Late Jurassic Tethys Ocean

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In the Late Jurassic calcareous nannoplankton experienced a progressive increase in diversity, abundance and degree of calcification, culminating in the Middle Tithonian – Berriasian interval (Calcareous Nannofossils Zone NJK and NJ1 – Bralower et al., 1989). Were there any linkages between calcareous nannoplankton evolution and geologic, palaeoceanographic or palaeoclimatic events?

Upper Oxfordian - Berriasian selected sections from the Southern Alps (N Italy) have been analyzed for calcareous nannofossil biostratigraphy, relative and absolute abundances and palaeofluxes. Data were compared with litho-magneto-chemostratigraphy and available information on the tectonic, palaeoceanographic and palaeoclimatic regime.

A calcareous nannofossil increase in diversity, abundance and calcification occurred, inducing a major change in pelagic sedimentation from predominantly siliceous (Radiolarite fm. and lower part of the Rosso ad Aptici fm.) to mostly calcareous (upper part fo Rosso ad Aptici fm. and Maiolica fm.). In particular, an impressive speciation started in the Tithonian, including the first occurrence and early diversification of nannoliths and nannoconids. The increase in abundance of coccoliths and nannoliths affected the ocean carbonate system, especially because of the high rates of some nannolith calcification.

These nannoplankton evolutionary events occurred during times of low spreading rates, low pCO_2, low Mg/Ca ratio, cool climatic conditions and relatively oligotrophic oceans. Available data suggest that calcareous phytoplankton was stimulated by envi-

ronmental stability rather than perturbations. This is consistent with modern coccolithophorid distribution, showing highest diversity and abundance as well as calcification in stable oligotrophic oceanic areas.

A precise stratigraphic control allows to model the Late Jurassic nannofossil speciation episode and the abundance increase of high-calcified genera (*Conusphaera, Polycostella, Faviconus, Nannoconus*), evaluating environmental causes and consequences of evolution.

Preliminary results suggest that the Late Jurassic nannoplankton evolution was mostly controlled by the following factors: A) a decrease in pCO_2 due to decreased spreading rate and/or increased weathering rate ($^{87}Sr/^{86}Sr$); B) a decrease in oceanic Mg/Ca ratio values promoting low Mg-$CaCO_3$ and $CaCO_3$ biomineralization (*nannofossils fertilization* sensu Stanley, 2006); C) cool climatic condition (Price, 1999).