# Calcareous Nannofossil and Calpionellid calcification events across Tithonian – Berriasian time interval and low latitudes paleoceanographic implications

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The Tithonian-Berriasian time interval is characterized by a major calcareous nannofossil speciation episode and by the appearance of calpionellid group: several genera and species first appear and evolve, showing an increase in diversity, abundance and particularly in calcification degree.
This time interval is also characterized by a significant low latitudes increase of carbonate-rich sediments (Rosso ad Aptici fm. toward Maiolica fm.).
Calcareous nannofossil and calpionellid biostratigraphy and absolute abundances have been performed on low latitudes selected sections in order to reconstruct biogenic calcite palaeofluxes. Calpionellid has been investigated on thin sections (25µm thick), while calcareous nannofossil on the same thinnered thin sections (up to 7$\mu$m thick) used for calpionellid. All specimens have been counted on 1 $cm^2$ of thin section or 1 $mm^2$ of ultra-thin section respectively for calpionellid and calcareous nannofossil. Paleofluxes have been obtained integrating absolute abundance with single speciment mass weigh ($10^{-12}$gr of calcareous carbonate) per area unit ($cm^2$) per time unit (yr).
Calcareous biogenic paleofluxes point out a link between the lithologic changes and calcified plankton evolution across the Tithonian – Berriasian interval. During Lower Tithonian (Rosso ad Aptici Fm.) a first calcification event is characterized by nannolith (*F.multicolumnatus*, *C.mexicana*, *P.beckmannii*) increase in abundance, size and calcification degree, followed by the occurrence of first calcified calpionellid (*Tintinopsella*). Across Upper Tithonian to Lower Berriasian (Rosso ad Aptici fm. – Maiolica transition and Maiolica fm.) a second bigger calcification event is characterized by a dramatic increase of nannoconid abundance and calcification degree reaching lithogenetic amounts, concomitant with a moderate abundance increase of calcified calpionellid (genera *Crassicollaria, Calpionella, Remaniella*).
Linkages between calcareous nannofossil and calpionellid evolutions with geologic, palaeoceanographic or palaeoclimatic events are inferred. The diversification and biomineralization of high-calcified plankton produced a major increase in pelagic carbonate sedimentation due to the onset of paleoenvrionmental conditions favorable to calcification. The diversification and proliferation of nannolith and nannoconid, interpreted as inhabitants of the lower photic zone, might indicate the establishment of a thermocline/nutricline in the deep photic zone, suggesting the develope of oligotrophic and stable oceanic conditions.
It is also suggested that Tithonian-Berriasian calcified plankton evolution could be controlled by a decrease in $pCO_2$, due to decreased spreading rate and/or increased weathering rate ($^{87}Sr/^{86}Sr$) and cool climatic conditions, concomitant with a decrease in oceanic Mg/Ca ratio values. Both factors thermodynamically promoted low Mg-$CaCO_3$ and $CaCO_3$ biomineralization supporting calpionellid and calcareous nannofossil abundance and calcification rate increases.