Foraminifera and calcareous nannofossils integrated biostratigraphy at southern high latitudes: searching for precision in global correlations

Maria Rose Petrizzo*†[1], David K. Watkins[2], and Erik Wolfgring[3]

[1]Department of Earth Sciences, University of Milan – Italy
[2]Department of Earth Atmospheric Sciences, University of Nebraska – United States
[3]Department of Palaeontology, University of Vienna – Austria

Abstract

We established an integrated biostratigraphic framework of the upper Cenomanian to Santonian interval at southern high latitudes based on the stratigraphic distribution of planktonic and benthic foraminifera and of calcareous nannofossils. Data are collected from Integrated Ocean Discovery Program (IODP) Sites U1513 and U1516 drilled in the Mentelle Basin (eastern flank of the Naturaliste Plateau, Indian Ocean, SW Australia) during Expedition 369. These sites were located at a paleolatitude ranging from 57∘S to 62∘S during the Late Cretaceous.
The calcareous plankton assemblages across the Cenomanian-Turonian boundary interval are characterized by the absence of several taxa that are normally common at mid- to low latitudes, including most of the marker taxa used to constrain the boundary interval. However, among calcareous nannofossils *Helenea chiastia* and *Quadrum gartneri* are confirmed to be reliable bioevents to approximate the Cenomanian/Turonian boundary. Moreover, calcareous plankton bioevents, combined with the carbon isotopic data, are correlated with records at low latitudes in the Tethys and Western Interior Seaway. They provide a good chronostratigraphic and integrated stratigraphy framework that represents one of the best documented records across the Cenomanian-Turonian boundary interval for high latitudes of the Southern Hemisphere. Benthic foraminiferal markers occurring during the Cenomanian-Turonian transition in the southern high latitudes are predominantly gavelinellids associated with infaunal opportunist agglutinated and calcareous taxa, including *Gavelinella intermedia* and *Gavelinella vesca*, also documented from mid-Cretaceous Tethyan settings, and *Lingulogavelinella turonica* and *Scheibnerova protintidica*, principally known from the southern high latitude record.

The calcareous plankton assemblages from the lower Turonian to the Santonian interval reveal a Tethyan affinity for some of the assemblages, and confirms the applicability of the calcareous nannofossil CC zones of Perch-Nielsen (1985) and the reliability of the mid- to high latitude biozonation for planktonic foraminifera (Petrizzo et al., 2020). The Turonian/Coniacian boundary is inferred to fall within Zone CC13 and between the LO (last occurrence) of the planktonic foraminifera *Falsotruncana maslakovae* and the LO of the calcareous nannofossils *Micula staurophora* in agreement with mid- to low latitude records (NW

*Speaker
†Corresponding author: mrose.petrizzo@unimi.it

Australia, Tanzania and Tethyan localities). The Coniacian/Santonian boundary lies within Zone CC16 and is placed at the LO of the planktonic foraminifera *Globotruncana linneiana,* in agreement with the definition of the Santonian Global Stratotype Sections and Points (GSSP).

The benthic foraminiferal assemblages show high similarities with the South American records, and only rara taxa, including *Gavelinella berthelini,* in the Turonian to lower Coniacian interval, and *Notoplanulina rakauroana*, in the lower Coniacian to upper Santonian interval, can be used for worldwide correlations. However, we record the FO of the agglutinated marker taxon *Bulbobaculites problematicus* in the lowermost Turonian used in the Tethyan zonation of Geroch and Nowak (1984).

In this study, the foraminifera and calcareous nannofossils bioevents observed in the Mentelle Basin are discussed and compared with the records reported from stratigraphic sections located at lower latitudes to verify the stratigraphic distribution of cosmopolitan taxa. Finally, we provide an integrated biostratigraphic scheme highlighting the synchronicity of marker species and their reliability for global correlations from low- to high southern latitudes.

References

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