



Publisher's note

Quaternary coccolithophore palaeoceanography

High resolution study of Quaternary coccolithophores and other nannofossils from selected cores to address palaeoceanographic questions has become a significant focus of nannofossil research. Several presentations on this theme were given at the International Nannoplankton Association in Lisbon in 2004 and have subsequently been written up for this special issue of Marine Micropalaeontology. The volume includes five such studies from locations around the world all focussed on the Mid- to Late-Pleistocene.

A recurrent theme of the discussions is the complexity of interpreting assemblage variations in the context of multiple oceanographic influences, an absence of well-established assemblage-based proxies, and in many cases an absence of basic information on the ecological preferences of key species. In response to this a range of approaches are adopted here, including different types of statistical analysis and use of complementary data from other proxies. All the studies suggest that a wealth of high quality data is contained in the nannofossil record, but better routine tools for interpreting it are clearly needed.

One such tool is the abundance of the deep-photic species *Florisphaera profunda*. This is becoming increasingly well-established as a valuable palaeoproductivity proxy following the pioneering studies of Molfino and McIntyre (1990) and Beaufort et al. (1997). Liu et al. here apply this proxy in isolation to construct a high resolution record from the South China Sea over the last 1500 kyr documenting, in particular, strong sub-glacial cyclicity in productivity and an important shift across the Mid Pleistocene Revolution from interglacials being low productivity intervals to high productivity intervals.

The contrasting conditions before and after the Mid-Pleistocene revolution are further explored by Marino et al. using a pair of cores from the Eastern Mediterranean and the North Atlantic. Again they infer change in productivity regime across the event with a trend toward more stable and oligotrophic surface waters in the Middle Pleistocene. They also provide a useful review of the, often very incomplete, knowledge of the ecology of the main coccolithophore species.

F. profunda is also used to good effect by Lopez-Otalvaro et al., although here also with other coccolith-derived data, in a study of the last 600 kyr from the Eastern Equatorial Pacific

(ODP Site 1240). Productivity indicators and especially *F. profunda* abundance are used to infer that during the interglacial Marine Isotope Stage 5 the environment was much more oligotrophic in this area than before or since, suggesting extended El-Niño type conditions.

The complexity of the oceanographic system and the limitations of any one proxy, and specifically of *F. profunda*, are highlighted by Andrulleit et al. and Incarbona et al. Andrulleit et al. use nannofossils from the last 300 kyr from a core south of Java to document precession-modulated fluctuations in upwelling as a result of variable intensity of the Indonesian Throughflow. In this area there is a strong productivity signal from surface dwelling coccolithophores but not from *F. profunda*, which is interpreted as being due to the influence of the low salinity Indonesian Throughflow waters on surface productivity. Similarly, Incarbona et al. use a range of proxies including planktonic foraminiferal and geochemical data in their interpretation of an expanded core recording centennial-scale environmental change over the interval 140–20 kyr from the Sicilian Channel. They document an extended interval of low productivity during Marine Isotope Stage 5 but with high *F. profunda* abundances only in the earlier part.

Finally, Gravalosa et al. document extant coccolithophore assemblages from the East Pacific sector of the Southern Ocean, to provide fundamental data to allow palaeoceanographic study of the region. They show clearly that coccolithophores are more consistently present in the area than has been suggested but are strongly associated with the primary frontal systems, the Sub-Antarctic Front and Polar Front increasing in both abundance and diversity in the frontal zones and so potentially forming valuable indicators of frontal position in the fossil record.

Taken together these papers provide a good cross section of the types of palaeoceanographic studies being undertaken using Quaternary nannofossils and show some clear challenges for development of the field.

References

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