Morphological variation in the genus Umbilicosphaera from the Pliocene through Pleistocene of ODP 709C (western Indian Ocean) and 994C (northwestern Atlantic) cores

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The present study examined the calcareous nannofossil biostratigraphy of, and the morphological variation in, the genus *Umbilicosphaera* from the Pliocene through Pleistocene in ODP cores 709C (western Indian Ocean) and 994C (northwestern Atlantic). An unreported morphotype was identified from Okada and Bukry's (1980) Zone CN12 through Subzone CN10b. The first occurrence (>5 Ma) of this morphotype is much older than those of *U. sibogae* and *U. foliosa*. This morphotype is similar to *U. sibogae* in having a wide (>1 μm) central opening and monocyclic, imbricated elements in both shields, but differs in having the proximal shield smaller than the distal shield. The difference between the central-area diameter and the central-opening diameter is less than 0.7 μm in the new morphotype, which is due to the steeper surface of the tube elements around the central opening, while *U. sibogae* has a larger central-area ratio to the central opening. This new morphotype is referred to as *Umbilicosphaera* sp. A. *Umbilicosphaera sibogae* became dominant over *Umbilicosphaera* sp. A in subzones CN11b–CN12a. The presence of intermediate forms of *U. sibogae* and *Umbilicosphaera* sp. A suggests that *U. sibogae* evolved from *Umbilicosphaera* sp. A, rather than from either *U. rotula* or *U. jafari*. These results suggest that evolution in the *Umbilicosphaera* spp. occurred simultaneously with the evolution in eutrophic taxa (*Gephyrocapsa* spp.) as part of the floral turnover during the Pliocene–Pleistocene transition.

References

Okada, H. & Bukry, D. 1980. Supplementary modification and introduction of code numbers to the low-latitude coccolith biostratigraphic zonation (Bukry, 1973, 1975). *Marine Micropaleontology*, **5**: 321–325.