Changes in calcareous nannoplankton assemblages across the Eocene–Oligocene transition in the Hungarian Paleogene Basin (Central Paratethys)

Anita Nyerges

Eötvös Loránd University, Department of Physical and Applied Geology, Budapest H-1117, Hungary; MTA-MTM-ELTE Research Group for Paleontology, H-1431 Budapest, Hungary; anyerges@caesar.elte.hu

Ádám T. Kocsis

Universität Erlangen-Nürnberg, GeoZentrum Nordbayern, Department of Geography and Geosciences, 91054 Erlangen, Germany; MTA-MTM-ELTE Research Group for Paleontology, H-1431 Budapest, Hungary; adamkocsis@caesar.elte.hu

József Pálfy

Eötvös Loránd University, Department of Physical and Applied Geology, Budapest H-1117, Hungary; MTA-MTM-ELTE Research Group for Paleontology, H-1431 Budapest, Hungary; palfy@elte.hu

The Eocene-Oligocene transition (EOT), the last major greenhouse-icehouse climate state shift in Earth history, ended the warm, ice-free early Paleogene world and ushered in Antarctic glaciation. The Paratethys was an unique epicontinental seaway that existed from ~34–12Ma in an area that was affected by the ongoing Alpine orogeny. This study focused on the Hungarian Paleogene Basin within the Central Paratethys in order to characterize the effect of the global cooling event on the calcareous nannoplankton, reconstruct the paleoenvironmental evolution of the region across the EOT, and compare it with the global trends.

Closely spaced samples were collected from the Cserépváralja-1 drillcore between 440.8 and 383.5m and were studied using paleontological and statistical analyses. Calcareous nannoplankton biostratigraphy focused on documenting Zone NP21, which includes the Eocene-Oligocene boundary. Hierarchical cluster analysis made it possible to distinguish five successive assemblages in the studied core section. Phases of calcareous nannoplankton community evolution were compared with recently published trends in $\delta^{18}O$ and $\delta^{13}C$ isotope values and foraminiferal changes. The lowest assemblage is dominated by taxa with a preference for oligotrophic and warm surface waters. The next assemblage is marked by a nannoplankton turnover and signals a phase of eutrophication and incipient cooling. Nannoplankton abundance drops to a minimum in the third phase, which represented the coldest climate within the EOT. A gradual rebound of nannoplankton abundance occurred in the fourth phase, when ameliorated environmental conditions occurred that are postulated to have been influenced by regional climate change related to the uplifting of the Alps. The youngest assemblage includes mainly euryhaline taxa, which could tolerate an increase in the rate of freshwater and terrestrial influx.

These stepwise changes in calcareous nannoplankton assemblages are comparable to global trends, which suggests that in addition to a regional overprint controlled by the ongoing Alpine orogeny, environmental and biotic evolution across the EOT in the Central Paratethys was affected by global climate shifts that were triggered by Antarctic glaciation.