Changes in Calcareous Nannoplankton Assemblages Across the Eocene–Oligocene Transition in the Hungarian Paleogene Basin (Central Paratethys)

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ABSTRACT

The Eocene-Oligocene transition (EOT) is the last major greenhouse-icehouse climate state shift in Earth history, ending the warm, ice-free early Paleogene world and ushering in the Antarctic glaciation. Our understanding of this event is largely based on data from ocean drilling, and the record is much more scarce from epicontinental seas. The Paratethys was such an epicontinental seaway that existed ~34–12 Ma in an area affected by the ongoing Alpine orogeny. This study is focused on the Hungarian Paleogene Basin within the Central Paratethys, aiming to characterize the effect of the global cooling event in the calcareous nannoplankton and to reconstruct the paleoenvironmental evolution of the region across the EOT while comparing it with the global trends. The Cserépváralja-1 drillcore was sampled at high-resolution and studied using paleontological and statistical analyses. Calcareous nannoplankton biostratigraphy was focused on documenting the NP 21 zone which includes the Eocene/Oligocene boundary. Hierarchical cluster analysis allowed to distinguish five successive assemblages is the studied core section. Phases of calcareous nannoplankton community evolution are compared with recently published trends in δ18O and δ13C isotope values and foraminiferal changes. The lowest assemblage (440.8–425.2 m) is dominated by taxa with preference for oligotrophic and warm surface waters. The next assemblage (425.2–418 m) is marked by nannoplankton turnover and signals a phase of eutrophication and incipient cooling, when taxa adapted to cold surface waters gradually became dominant. Nannoplankton abundance drops to a minimum in the third phase (418–413.2 m), which is interpreted to represent the coldest climate within the EOT. A gradual rebound of nannoplankton abundance is observed in the fourth phase (413.2 –404.2 m) when ameliorating environmental conditions are postulated, possibly affected by regional climate change related to the uplifting Alpine chain. The youngest assemblage in the studied core (404.2 –383.5 m) includes mostly 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 the global trends, suggesting that beside 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 triggered by Antarctic glaciation.