Cretaceous–Paleogene calcareous nannofossils and their biostratigraphic and paleoceanographic implications in southern Tibet

Yasu Wang

Hohai University, College of Oceanography, Nanjing 245700, China; wangyasu@hhu.edu.cn

Shijun Jiang

Hohai University, College of Oceanography, Nanjing 245700, China; ssj0047@my.fsu.edu

Hong Su

Jinan University, College of Life Science and Technology, Guangzhou 510632, China; suhong301@jnu.edu.cn

Denise Kulhanek

Christian-Albrechts-University of Kiel, Institute of Geosciences, 24118 Kiel, Germany; denise.kulhanek@ifg.uni-kiel.de

Davide Persico

University of Parma, Department of Chemistry, Life Sciences and Environmental Sustainability, Parma, 43124, Italy; davide.persico@unipr.it

https://doi.org/10.58998/jnr3302

Tibet, known as the Earth's third pole, was once part of the eastern Tethys Ocean and now serves as a key region for paleoceanographic and paleoclimate research due to its arguably most complete, continuous Cretaceous through Paleogene marine strata in China. Previous studies have shown that this region contains reasonably well-preserved and diverse calcareous nannofossil assemblages, with over 100 nannofossil species identified from the Upper Cretaceous, more than 60 from the Lower Cretaceous, and over 60 from the Paleogene. These findings not only demonstrate the diversity and preservation of Tibetan nannofossils but also form the foundation for Cretaceous–Paleogene paleoceanographic research. However, there are significant challenges, such as harsh geography, intense tectonic activity, diagenesis, and terrestrial dilution, which collectively hinder nannofossil studies. Consequently, there have been few calcareous nannofossil biostratigraphic studies in Tibet, highlighting the need for innovative approaches, international collaborations, and unwavering perseverance in research.

Recent studies in Tibet over the past decade have advanced the application of calcareous nannofossils in identifying significant geological events and paleoceanographic changes. These studies were conducted primarily in southern Tibet, which was formerly part of the India Plate, and they emphasize the importance of accurate biostratigraphic frameworks for understanding the paleoceanographic evolution of the region. To date, nannofossils have been instrumental in dating the Oceanic Anoxic Event (OAE) 1b, OAE 1d, and OAE2, the Cretaceous/Paleogene (K/Pg) boundary, and the India–Eurasia plate collision. They also indicate that the final closure of the eastern Tethys Ocean in the early Eocene was due to tectonic uplift, which may have caused Cretaceous fossils to be extensively redeposited into Paleogene sediments. Paleoceanographic conditions can be inferred from nannofossil assemblages using species with specific ecological preferences to indicate variations in ocean surface temperature and nutrient conditions, which can be formulated as temperature and nutrient indices, respectively. These indices provide valuable insights into past oceanographic conditions and contribute to our understanding of climate change over geologic timescales.

Acknowledgements:

This work was jointly funded by the National Key R&D Program of China (2022YFF0800800) and the National Natural Science Foundation of China (No. 42372004, 42206047).