

Potential relationship between Mesozoic volcanic phosphorus supply and evolution of two terrestrial biotas in northern China based on geochemical and paleontological records

YANJIE TANG AND CHAO MA

Yangtze University

The Yanliao and Jehol biotas of northern China are two world-class Lagerstätten that emerged and thrived in an area characterized by widespread Mesozoic volcanic eruptions. These biotas offer a unique window into the terrestrial ecosystems of the Mesozoic era. In comparison, the Jehol Biota is more flourishing and representative than the Yanliao Biota. Zhou et al. [1] proposed that the eastward expansion of the Jehol Biota generally coincided with the eastward shift of arc volcanism, which was controlled by the subduction of the paleo-Pacific plate. These observations suggest that large-scale Mesozoic volcanism significantly influenced the surface environment, thereby promoting the development of terrestrial biotas. However, the potential coupling between volcanism and the rapid proliferation of terrestrial biotas remains largely unclear. Since the rapid alteration and weathering of volcanic products directly link volcanism to the surface environment [2], the compositional variations in volcanic sequences can provide critical insights into this issue from the perspective of nutrient supply.

Phosphorus (P), an essential nutrient for life, can be supplied to terrestrial ecosystems through the weathering of volcanic rocks. We have identified episodic increases in phosphorus delivery, biological productivity, and species abundance within Mesozoic strata, which suggest a coevolutionary relationship between volcanism and terrestrial biotas [3]. The massive supply of phosphorus from the weathering of extensive volcanic products associated with craton destruction supported a terrestrial environment conducive to the high prosperity of the Jehol Biota. During the early stages of craton destruction, this volcanic-biotic coupling can also explain the preceding Yanliao Biota, which is characterized by relatively fewer fossils.

REFERENCES

- [1] Zhou Z, Meng Q, Zhu R, et al. Spatiotemporal evolution of the Jehol Biota: responses to the North China Craton destruction in the Early Cretaceous. *Proc Natl Acad Sci USA* 2021, 118:e210785918.
- [2] Longman J, Mills BJW, Manners HR, et al. Late Ordovician climate change and extinctions driven by elevated volcanic nutrient supply. *Nat Geosci* 2021, 14: 924-9.
- [3] Ma C, Tang Y, Mitchell R N, et al. Volcanic phosphorus supply boosted Mesozoic terrestrial biotas in northern China. *Sci Bull*, 2023, 68(12): 1317-1326