Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.31999

Developing the boron isotope palaeo-CO_2 proxy in siliceous radiolarians

SOPHIE WESTACOTT[1], EMMELINE GRAY[1], OLLIE LAUB[2], BERNÁT HESZLER[1], LISA FRIBERG[1] AND MICHAEL J. HENEHAN[1]

[1]University of Bristol
[2]Utah State University

Boron isotope ratios ($\delta^{11}B$) in planktic foraminifera are a staple of past atmospheric CO_2 reconstruction, but their utility is limited by the availability of well-preserved fossils, particularly prior to the Cenozoic. A sister taxon to the planktic foraminifera, the silicifying radiolaria, are also pelagic and crucially have a fossil record extending from the Cambrian to the modern. If the boron isotope composition of radiolarians ($\delta^{11}B_{radiolarian}$) was to show some predictable covariation with pH as that of foraminifera does, it could open up vast swathes of the Mesozoic and Palaeozoic to the application of this proxy. In spite of this potential, radiolarians have not yet been explored as a possible medium for the $\delta^{11}B$-CO_2 proxy, in part due to difficulty culturing them in laboratory-controlled conditions.

Here, we present some of the first boron isotope ratios measured in radiolarians, evaluating the environmental and phylogenetic controls on $\delta^{11}B_{radiolarian}$. We also present results from two three-month culturing seasons where we maintained radiolarians under different pH levels in order to test the relationship between $\delta^{11}B_{radiolarian}$ and pH (and hence $pCO_{2)}$ while controlling for other variables. While preliminary, we hope that these serve to encourage investigations into the ecology, physiology, and geochemical proxy potential of this charismatic member of the Rhizaria.