Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.29129

Linking Phanerozoic extinctions to large igneous provinces: New insights from frequent millennial-scale oceanic redox oscillation events recorded by pyrite $\Delta^{33}S$

MANG LIN AND XIAOXIAO YU

Guangzhou Institute of Geochemistry, CAS

Phanerozoic extinctions may have been influenced by oceanic redox oscillations, as indicated by mixing-induced negative pyrite $\Delta^{33}S$ ($\Delta^{33}S_{py}$). However, the frequencies, intensities, and timescales of these oscillations remain elusive. Here, we measured stratigraphic $\Delta^{33}S_{py}$ from the currently anoxic Cariaco Basin, spanning ~0.6 million years. Our results reveal two distinct patterns of negative $\Delta^{33}S_{py}$ that are linked to specific redox oscillations, potentially analogous to patterns recorded during Phanerozoic extinctions. During Marine Isotope Stage 1–2 and 9–10, bottom water experienced redox oscillations on a timescale of ten thousand years, resulting in slightly negative $\Delta^{33}S_{py}$ (-0.03‰). In contrast, during the period of 160-200 kyr BP, bottom water underwent frequent redox oscillations on millennial- and centennial- timescales, leading to significantly more negative $\Delta^{33}S_{py}$ values (-0.09‰). We highlight that similarly frequent oceanic redox fluctuations may have contributed to the End-Guadalupian extinction, when notably negative $\Delta^{33}S_{py}$ values akin to those observed in our study were prevalent. In the context of the potential links between the End-Guadalupian extinction and the Emeishan large igneous province, we will further discuss the potentially causal relationship between the large-scale volcanic activity induced by deep Earth processes and the biotic crisis triggered by frequent millennial-scale oceanic redox oscillation in a warming world.