Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.16343

Rapid increases in continental silicate weathering across the Permian-Triassic boundary corresponding to massive carbon emission

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The end Permian witnessed the most severe mass extinction event through the Phanerozoic, closely related to the global environmental deteriorations, for instance, extremely warming climate, oceanic acidification and anoxia [1]. Global climatic and environmental changes at the end Permian have been commonly suggested as a result of intense volcanism and massive CO_2 emissions [1]; however, the response and consequence for such extreme climate conditions have yet to be directly constrained. Here, we reported high-temporal resolution lithium isotope (δ^7Li) records from three shallow-marine carbonate successions through the Permian-Triassic transition. All three successions congruently documented rapidly decreased δ^7Li values prior to the Permian-Triassic boundary and persistently low δ^7Li values during the earliest Triassic. Considering and correcting for the effects of global temperature and marine reverse weathering on δ^7Li records, our data indicate rapid increases in continental silicate weathering rates in the latest Permian and high silicate weathering rates persistently in the earliest Triassic. The quick response of continental silicate weathering to the massive volcanic CO_2 emission may have directly induced marine eutrophication and anoxia in a short time scale. Additionally, persistently high silicate weathering rates were consistent with the records of high atmospheric CO_2 concentrations in the earliest Triassic [2], likely accounting for long-term marine anoxia and delayed biological recovery after the end-Permian extinction.

Reference

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