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Tracing Ancient Hydrothermal Activity: Lithium Isotope Insights into the Jurassic Adriatic Platform

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The isotopic composition of lithium (δ^7Li) in marine carbonates is an increasingly recognized proxy for deciphering ancient seawater chemistry, shedding light on changes in hydrothermal, continental weathering, and reverse weathering across geologic timescales[1,2]. This study first reports high-resolution δ^7Li values in Jurassic carbonates (~ 177–146 Ma) from the Adriatic Carbonate Platform, Croatia[3], to elucidate δ^7Li behavior in Jurassic oceans. Our analyses reveal relatively stable δ^7Li values in bulk marine carbonates, ranging from 17 to 23‰ through the mid to late Jurassic, supporting the notion of uniformly low seawater δ^7Li levels[4].

Employing Monte Carlo simulations for Li mass balance and integrating Sr-Li isotope modeling, our research advances the comprehension of factors influencing seawater δ^7Li values. Our modeling results indicate that δ^7Li values are governed by a combination of hydrothermal and riverine inputs, with evidence pointing to increased hydrothermal fluxes and reduced riverine contributions since the Middle Jurassic (~170 Ma). This interplay led to a slight elevation in Late Jurassic seawater δ^7Li, emphasizing the complexity of oceanic lithium cycles. Our investigation not only refines the use of δ^7Li in marine carbonates as a proxy for paleoseawater composition but also emphasizes Sr and Li isotopes as dual indicators for tracking both hydrothermal and continental weathering.

References

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