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Lithium isotope evidence for enhanced reverse weathering during the Early Triassic warm period

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Elevated temperatures persisted for an anomalously protracted interval following volcanic carbon release at the end-Permian. It has been proposed that reverse weathering—the formation of authigenic clay minerals in the marine environment—may have contributed to the Early Triassic warm interval by driving enhanced carbon recycling within the ocean-atmosphere system. Here, we present lithium isotopes (δ^7Li) in marine shales and cherts spanning the Late Permian to Middle Triassic, demonstrating that marine siliciclastic sediments can serve as a reliable archive for recording changes in marine authigenic clay formation. We observe the highest δ^7Li signatures ever reported for marine siliciclastic sediments during the Early Triassic. This data provides a new lower boundary for seawater δ^7Li that is significantly higher than previously suggested based on carbonates. A simple mass balance demonstrates that these siliciclastic sediment δ^7Li values reflect an increase in the marine authigenic clay content of marine sediments during the Early Triassic warm period. Based on this, our modeling work suggests enhanced reverse weathering could have sustained elevated CO_2 levels during this time interval.