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Reconstructing the secular evolution of lithium isotope composition of seawater from marine halite

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The lithium isotopic composition of seawater (δ^7Li_{SW}) has emerged as a promising tracer for reconstructing global terrestrial silicate weathering and marine reverse weathering. While chemical weathering plays an important role acting as a negative feedback mechanism for the long-term control of the carbon cycle and stabilization of climate and surface temperature, reverse weathering acts as an important, yet largely under-appreciated, positive carbon feedback [1]. Recent records of δ^7Li_{sw} derived from foraminifera [2], brachiopods [3,4], and shallow marine carbonates [5] show a significant increase of ~8–9‰ over the past 60 Myr. However, laboratory experiments [6] and studies of drill cores from modern carbonate platforms [7] suggest that the δ^7Li values from skeletal and non-skeletal carbonates are complicated by vital effects, diagenesis, and mineralogy (e.g., calcite vs. aragonite). Thus, other archives are needed to determine whether carbonate δ^7Li values indeed reflect secular changes in δ^7Li_{sw}. Here, we present δ^7Li data from fluid inclusions in marine halites collected from modern salinas (solar evaporation ponds). Fluid inclusions in halite were used to document the major, minor, and trace element composition of paleoseawater, including lithium concentration. δ^7Li from a large suite of Neoproterozoic and Phanerozoic marine halites will provide a new independent archive of δ^7Li_{sw} and expand the recent record of the δ^7Li_{sw} of Cenozoic seawater based on foraminifera and brachiopods to 830 Myr.

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