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Secular evolution of boron isotope composition of seawater archived in evaporites?

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The boron isotope composition of the ocean is homogeneous, but varies on multi-million year time scales, given its residence time of approximately 10 million years. To date, the secular evolution of the oceanic boron isotope budget has been difficult to constrain. The lack of knowledge on past boron isotope composition of seawater ($\delta^{11}B_{sw}$) poses a major uncertainty for reliable boron-based pH and CO_2 reconstructions from Earth's geologic past and critically limits our understanding of the global biogeochemical cycling of this important element through time.

Marine evaporitic minerals bearing fluid inclusions – and halites in particular – present a highly appealing archive for reconstructing $\delta^{11}B_{sw}$ given their direct origin from seawater. However, the interpretation of their boron isotope signatures is not straightforward due to the possibility of fractionation during evaporation and crystallisation. Here we present first insights into boron isotope evolution during evaporite formation from laboratory experiments and natural modern evaporitic settings. These data enable us to place constraints on boron fractionation in ancient evaporites, offering new insights into $\delta^{11}B_{sw}$ during some of the key periods of the Phanerozoic.