The geologic history of seawater $\delta^{18}O$ from marine Fe oxides

NIR GALILI[1]*, RUTH YAM[1], ALDO SHEMESH[1] & ITAY HALEVY[1]

[1] Dept. of Earth and Planetary Sciences, Weizmann Institute of Science, Israel. (*nir.galili@weizmann.ac.il)

Despite significant progress, the geologic history of seawater $\delta^{18}O$ remains controversial. Uncertainty in $\delta^{18}O$ of seawater through time limits the utility of oxygen isotope geothermometry, with implications for our ability to constrain Earth's climate history. Two major issues with existing mineral repositories of oxygen isotopes (e.g., carbonate rocks and chert) are the similar temperature dependence of the isotopic fractionation between these minerals and water, and the sensitivity of the primary isotopic signal to post-depositional (e.g., late diagenetic or metamorphic) alteration. Fe oxides are geologically abundant, resistant to O isotope exchange under most conditions, and display a relatively temperature-independent water-oxide O isotope fractionation. Given these advantages, we constructed a high-fidelity record of $\delta^{18}O$ in marine Fe oxides covering the Mesoproterozoic to the present day. The record implies that seawater $\delta^{18}O$ has been approximately invariant through Phanerozoic time, consistent with carefully picked Paleozoic brachiopods. By contrast, from the Mesoproterozoic to the early Paleozoic, seawater $\delta^{18}O$ has increased by ~8‰. We will present the new Fe oxide record, compare it with existing constraints, and discuss possible explanations for the long-term trend.