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Marine glauconites: A potential new archive of paleo seawater magnesium isotopes.

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The balance between continental and marine silicate weathering versus marine clay authigenesis acts as an important control on Earth's long-term carbon cycle and climate (1). Since, these silicate cycling processes also largely control the oceanic elemental budgets and fluxes of major cations in seawater in the ocean, affects key chemical properties of seawater (1).

Magnesium (Mg), a major cation in seawater, has close association with silicates as well as carbonate crystal lattices. Mg in the Earth's crust and ocean contain <0.1 % of total Mg in the bulk Earth displaying the largest Mg isotopic variation thus, becoming important for understanding the balance and global Mg cycling (2). Elemental output fluxes are attributed to widespread glauconite formation taking place at the shallow shelf (0–200m water depth) and in the deep-sea (>2000 m water depth) of the modern oceans have not been determined yet and are not fully accounted for in earth system models.

Here, we present the first δ^{26}Mg analyses of separated marine authigenic clays from ODP 959 and Oregan margin, focusing on smectite and glauconites, since these are the most widespread and abundant marine authigenic clays of the Phanerozoic. These clays demonstrate a wide range of lithologies, water depths, temperatures and sedimentation rates. Based on this sample set of clay mineral separates, combined with careful microscopic examination, Our results allow us for the first time to robustly constrain the δ^{26}Mg value of recent marine authigenic clays (glauconites). These measurements include carefully picked glauconites down the depth as well as sorted by size fraction. Our Mg isotope measurements on glauconites, -0.83 ± 0.1 ‰; n = 8,for ODP 959, and -0.70 ± 0.19, n=10 for Oregon margin both resemble strikingly similar value to seawater δ^{26}Mg, -0.82 ± 0.1 ‰. We consider the potential to reconstruct palaeo seawater δ^{26}Mg using glauconites, and re-assess the utility of seawater δ^{26}Mg as a novel silicate weathering and/or reserve weathering proxy.

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2. F.-Z. Teng, Magnesium isotope Geochemistry,