Deep sea corals as archives of seawater Zn isotopes

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Zinc (Zn) is bioessential. Its distribution in the modern oceans reflects a combination of biological uptake, remineralization and the physical ocean circulation [1]. The deep ocean below about 600–800m is isotopically homogeneous, at around +0.5‰ (δ^{66}Zn relative to JMC-Lyon) [2]. In contrast, the upper ocean exhibits considerably more variability, with reported isotope values between -1.1 to +1.2‰ [2], reflecting active biological cycling in the upper water column.

A reliable archive for past seawater Zn isotopes is so far lacking because Zn is present at high concentrations in potentially contaminating material, such as lithogenic or authigenic (e.g. Fe-Mn oxide) phases. Deep-sea corals are large enough to be aggressively physically and chemically cleaned, however, enabling effective removal of contaminating phases [3]. Deep-sea corals also have several other advantages over traditional paleoclimate archives, including the ability to assign precise ages to individual specimens [4].

We present δ^{66}Zn data for a suite of modern and recent (<1000 yr) deep sea corals from six ocean regions spanning the far North Atlantic to the Tasman Sea. Overall, there is good agreement between measured or best guess modern seawater δ^{66}Zn and coral aragonite δ^{66}Zn values, suggesting that corals of species *Desmophyllum dianthus* and genus *Caryophyllia* do not fractionate Zn isotopes during calcification. A small number of older fossil specimens, dated to previous glacial periods, were also analysed. These corals record Zn isotope signatures similar to modern seawater values, hinting at the relative constancy of oceanic Zn cycling on tens of thousands of year timescales. Future work will expand the glacial-age coral dataset in order to test this hypothesis.

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