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Zn isotopes in deep sea corals: a useful palaeoceanographic archive?

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Zinc (Zn) is an important bioessential trace element. Its distribution in the modern oceans reflects a combination of biological uptake, remineralization and the physical ocean circulation. Furthermore, the partitioning behaviour of Zn (D_{Zn}) and its isotopes ($\delta^{66}Zn$) in carbonates has been linked to ambient seawater carbonate chemistry [1-3].

Development of Zn isotopes in carbonates as a palaeoceanographic tool has been hampered by the high concentrations of Zn in contaminating material, such as lithogenic or authigenic (e.g. Fe-Mn oxide) phases. However, deep-sea corals are large enough to be subjected to aggressive physical and chemical cleaning, enabling effective removal of contaminating phases. They also have several other advantages over traditional palaeoclimate archives, including the ability to assign precise absolute ages to individual specimens based on uranium-series dating [4].

Here we present Zn/Ca and $\delta^{66}Zn$ 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. We observe what appears to be species-specific Zn partitioning behaviour, but no clear links between D_{Zn} or coral $\delta^{66}Zn$ and ambient seawater carbonate chemistry. Overall, there is good agreement between measured or best-guess modern seawater $\delta^{66}Zn$ and coral aragonite $\delta^{66}Zn$ values, suggesting that corals of species Desmophyllum dianthus and genus Caryophyllia do not significantly fractionate Zn isotopes during calcification. Deep sea corals may thus provide a useful archive of the past ocean Zn isotope composition and its spatial variability.

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