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Cold-water corals as archives of seawater Zn isotopes

SUSAN H LITTLE[1], DR. DAVID J WILSON[2], MARK REHKÄMPER[3], JESS ADKINS[4], LAURA F. ROBINSON[5] AND TINA VAN DE FLIERDT[3]

[1]University College London

[2]London Geochemistry and Isotope Centre (LOGIC), Institute of Earth and Planetary Sciences, University College London and Birkbeck, University of London

[3]Imperial College London

[4]California Institute of Technology

[5]University of Bristol

Presenting Author: susan.little@ucl.ac.uk

Traditional carbonate sedimentary archives have proven challenging to exploit for Zn isotopes, due to the high concentrations of trace metals in potential contaminants (e.g., Fe-Mn coatings) and their low concentrations in carbonate. Here, we present the first dataset of $\delta^{66}Zn_{JMC\text{-}Lyon}$ values for cold-water corals and address their potential as a seawater archive. Extensive cleaning experiments carried out on two corals with well-developed Fe-Mn rich coatings demonstrate that thorough physical and chemical cleaning can effectively remove detrital and authigenic contaminants. Next, we present Zn/Ca ratios and $\delta^{66}Zn$ values for a geographically diverse sample set of Holocene age cold-water corals. Comparing average Holocene cold-water coral $\delta^{66}Zn$ values to estimated ambient seawater $\delta^{66}Zn$ values ($\Delta^{66}Zn_{coral\text{-}sw} = \delta^{66}Zn_{coral} - \delta^{66}Zn_{sw}$), we find $\Delta^{66}Zn_{coral\text{-}sw} = +0.03 \pm 0.17‰$ (n = 20, 1SD). Hence, to a first order, cold-water corals record seawater Zn isotope compositions without fractionation, albeit with some variability. Finally, $\delta^{66}Zn$ data for a small subset of four glacial-age corals overlap with the Holocene coral dataset, hinting at limited glacial-interglacial changes in oceanic Zn cycling.