Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.7078

Reproducible paleo-pH and temperature reconstructions using cold-water coral aragonite fibers with an improved mechanical cleaning procedure

LÉLIA MATOS[1,2], ERIC DOUVILLE[3], FRANÇOIS THIL[3], PAOLO MONTAGNA[4], NORBERT FRANK[5], LOUISE BORDIER[3], ARNAUD DAPOIGNY[3], CLAUDIA WIENBERG[6] AND DIERK HEBBELN[6]

[1]IPMA
[2]CCMAR/IPMA
[3]LSCE/IPSL, CEA-CNRS-UVSQ
[4]ISP-CNR
[5]IUP
[6]MARUM

Presenting Author: leliamatos@yahoo.com

The increasing anthropogenic CO_2 release to the atmosphere is steering global ocean changes such as acidification and warming, threatening biological ecosystems. Models to predict future trends, needed by decision-makers, may be improved by long data-series. This is especially relevant for carbonate-based benthic ecosystems, highly threatened by the current ocean acidification trends. The geochemistry of modern and fossil cold-water corals may improve our knowledge by reconstructing past conditions at the subsurface and intermediate depths. Due to their accurately datable skeleton and bigger size (allowing several geochemical analyses to be done on the same colony/ individual), cold-water corals gained relevance as archives [e.g. 1]. In particular, cold-water coral boron isotopes ($\delta^{11}B$) and trace elements (Li/Mg, B/Ca) allow reconstructing carbonate chemistry and temperature changes. Their resilience to low carbonate ion concentrations make them valuable paleoceanographic archives for ocean acidification studies [2]. A recent work showed the effectiveness of the cold-water coral *Lophelia pertusa* $\delta^{11}B$ as a proxy for paleo-pH [3], however it also stressed the impact of vital effects recorded in specific areas of the skeleton structure: the centers of calcification (COC).

In this work we explore the application of an extensive mechanical cleaning protocol to minimize the influence of COC when using bulk solution samples to obtain reproducible $\delta^{11}B$ or elemental ratio values essential to reconstruct past pH or temperature changes. After a thoroughly mechanical cleaning protocol, we have combined bulk solution ICP-MS with LA-ICP-MS to analyze coral transects/subsamples collected along and across the polyps. Our results show that bulk solution ICP-MS $\delta^{11}B$ values are consistent and reproducible after extensive mechanical cleaning removing all coatings, burrows, the septa and visually-identified chalky areas of COC. These include the inner wall and base of the corallite, portions connecting adjacent polyps and areas around the oral disk.

[1] Robinson, L. F. et al. (2014) Deep Sea Research II 99, 184–198

[2] McCulloch, M. et al. (2012) Geochimica et CosmochimicaActa 87, 21–34

[3] Jurikova, H. et al. (2019) Chemical Geology 513, 143–152