

## Ba Isotopes in Cold Water Corals

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Recent studies have introduced the novel tracer stable Ba isotopes ( $\delta^{138/134}\text{Ba}$ ) in seawater. It can provide insight about the oceanic Ba cycle, the oceans biological pump, water mass provenance in the deep ocean and land-sea interactions including the tracing of riverine inputs [1]. Cold water corals (CWC) can be dated precisely by U-series measurements and may be a powerful archive of past changes in marine Ba isotope composition. A first study on cultured aragonitic scleractinian corals revealed an offset between coral and seawater  $\Delta^{138/134}\text{Ba}$  of  $0.02 \pm 0.16 \text{ ‰}$  to  $0.34 \pm 0.18 \text{ ‰}$  at  $25^\circ\text{C}$  [2].

Here, we show that CWCs grown in a natural environment, are a suitable archive for the isotopic composition of Ba  $\delta^{138/134}\text{Ba}$  in seawater. A total of 38 samples of 8 different species from 3 sites were analysed and compared to measurements of ambient seawater samples. To encompass a wide range of environmental conditions and Ba concentrations and isotopic compositions, the sites were chosen to cover a wide latitudinal range from the North and Equatorial Atlantic to the Drake Passage.

Seawater samples follow the well-established anti-correlation between Ba concentration and  $\delta^{138/134}\text{Ba}$  at all sites. Ba/Ca values in CWCs are linearly correlated to the Ba concentration in ambient seawater confirming previous studies [3]. An overall partition coefficient of  $D = 1.4$  is derived. Cold water coral  $\delta^{138/134}\text{Ba}$  shows a mean offset to seawater  $\delta^{138/134}\text{Ba}$  of  $\Delta^{138/134}\text{Ba} = 0.21 \pm 0.08 \text{ ‰}$  (2SD). No dependency on temperature or any other environmental conditions can be observed. A possible species effect on  $\Delta^{138/134}\text{Ba}$  of  $\pm 0.04 \text{ ‰}$  is on the same scale as external reproducibility.

Therefore,  $\delta^{138/134}\text{Ba}$  in naturally grown cold water corals reliably traces the Ba isotopic composition in ambient seawater to elucidate past changes of the oceanic Ba-cycle, the ocean's biological pump and water mass circulation.

[1] Horner et al., *EPSL* (2015) 430, 511-522

[2] Pretet et al., *The Depositional Record* (2016) 1, 118-129

[3] Anagnostou et al., *GCA* (2011) 75, 2529-2543