

## Reconstructing Decadal North Atlantic Water Mass Variability Using Cold-Water Corals

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Six cold-water corals of the species *Desmophyllum dianthus* from depths of 570m-700m were dated using a combination of uranium-series and <sup>14</sup>C dating, which showed two corals to be pre-industrial and the remaining four to have grown during the past century. Uranium-series dating carried out along the length of one of the corals shows that, for the ‘trumpet’ phenotype of *Desmophyllum dianthus* [1], skeletal growth is strongly linear.

Corals in the Northern Iceland Basin display large variability in Li/Mg ratio along the growth-axis of their skeletons. We interpret this as a record of decadal thermocline temperature changes over the lifetime of each coral, with temperatures ranging from ~2 °C to ~6 °C [2]. Moreover, εNd measurements along one coral show clear influence from arctic overflow water and North Atlantic gyre dynamics. A Temperature-εNd mixing model shows water composition primarily consists of Iceland-Scotland Overflow Water (~40% ± 10%) and Subarctic Intermediate Water (~40% ± 10%), with temperature variability driven by varying contribution of Western North Atlantic Central Water (20% ± 15%). Temperature records appear to follow, to first order, changes in the North Atlantic and Arctic Oscillations.

This shows that geochemical sampling along the length of the skeleton yields a linear time-series which spans the lifetime of the coral, with start- and end-points determined through dating of the base and top of the skeleton.

[1] Cairns, S., Häussermann, V., & Försterra, G. (2005) *Zootaxa* **46**, 15-46 [2] Montagna, P. et al. (2014) *Geochim. Cosmochim. Acta* **132**, 288-310