EGU2020-17827, updated on 28 Oct 2020
https://doi.org/10.5194/egusphere-egu2020-17827
EGU General Assembly 2020
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Equatorial Atlantic ventilation over the last century revealed by deep-sea bamboo coral radiocarbon records

Qian Liu[1], Laura F. Robinson[1], Joseph A. Stewart[1], Timothy Knowles[2], Erica Hendy[1], Tao Li[3], and Ana Samperiz Vizcaino[4]

[1]University of Bristol, School of Earth Sciences, United Kingdom of Great Britain and Northern Ireland
[2]Bristol Radiocarbon Accelerator Mass Spectrometry, University of Bristol, Bristol, BS8 1UU, UK
[3]Department of Earth and Planetary Sciences, Nanjing University, Nanjing, 210023, China
[4]School of Earth and Ocean Sciences, Cardiff University, Cardiff, CF10 3AT, UK

Despite growing interest in ocean-climate interactions in response to recent anthropogenic warming, historical hydrographic data with which to assess changes in the deep ocean over the last century are limited. With their robust calcium carbonate skeletons, deep-sea corals, especially long-lived bamboo corals, serve as a potential archive for reconstructing continuous high-resolution paleoceanographic records extending back hundreds to even thousands of years.

Here we use deep-sea bamboo corals collected between 800 and 2000 m water depth in the eastern equatorial Atlantic to reconstruct the ventilation history over the last century. Deep-sea bamboo corals have a jointed axis consisting of organic nodes and internodes composed of calcium carbonate. The radiocarbon content of the organic nodes documents the radiocarbon of surface water and likely records the distinctive bomb ^{14}C signal that can be used to generate a chronology for each coral specimen. By contrast, the radiocarbon content of calcite internodes records the radiocarbon signature of deep water over the lifetime of the coral. The reconstructed calcite radiocarbon record shows a quasi-periodic cycle of about two-decades, which is likely linked to multidecadal fluctuations in North Atlantic climate influencing the ventilation state of the water mass. In addition to radiocarbon records, we show that trace metal compositions of bamboo coral also provides key information with regard to both biomineralization processes, past environmental conditions, and chemistry of seawater. By combining radiocarbon and elemental composition of bamboo coral, we are building a set of tools with which to reconstruct deep ocean dynamics over the last century.