Millennial to centennial radiocarbon variability of the equatorial Atlantic over the last 25 ka

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The equatorial Atlantic which intersects major waters masses from the south and the north is one of the key locations to study how Atlantic Meridional Overturning (AMOC) responds to and affects deglacial climate changes as well as carbon cycling. Deep-sea scleractinian fossil corals, which thrive in the intermediate to deep ocean, are a promising paleoclimate archive that accurately record aspects of the seawater chemistry during coral growth. Here we report radiocarbon data of U-series dated deep-sea corals from the equatorial Atlantic intermediate to deep waters (EAI/DW) to study its ventilation and temporal links with climate over the last 25 ka. The samples reported here were collected in-situ by a remotely operated vehicle during the RRS James Cook Cruise JC094 in the northern equatorial Atlantic (5 – 15 °N) in water depths of 750-2100 m.

The reconstructed $\Delta^{14}C$ of EAIDW exhibits a pattern similar to the contemporary atmosphere (IntCal13[1]) with a offsets of ~60‰ to 220‰, depending on depth. During the Last Glacial Maximum, the $\Delta^{14}C$ (and radiocrbon age) offset of EAI/DW is greater than that of the late Holocene, indicating a somewhat reduced ^{14}C exchange with the atmosphere during the last glacial period. The deglaciation is characterized by two major steps of increased ventilation with respect to radiocarbon at the end of Younger Dryas and Heinrich Stadial 1. The timing of both events are synchronous with sudden atmospheric CO_2 concentration surges and abrupt Northern Hemisphere (NH) warming, providing evidence for ocean-driven centennial carbon cycle and climate changes during the last deglaciation.

[1] Reimer, P. J., et al. (2013). "Intcal13 and Marine13 Radiocarbon Age Calibration Curves 0-50,000 Years Cal Bp." *Radiocarbon* **55(4):** 1869-1887.