



Variability in the northeastern Atlantic intermediate water during the past 60 years as recorded by a cold-water coral from the Bay of Biscay

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Here we present the Li/Mg ratio, Nd-isotopic composition, and radiocarbon (^{14}C) values obtained on a precisely $^{230}\text{Th}/\text{U}$ dated post-modern framework-forming deep-sea coral of species *Madrepora oculata* sampled in the Bay of Biscay at ~691m water depth. In 2008, this coral was still alive during sampling using a Remotely Operated Vehicle (ROV) 'Genesis' on the R/V Belgica (De Mol et al., in press). Based on the selected tracers of water mass origin, temperature and ventilation we investigate here changes in the advection patterns of intermediate water masses in the Bay of Biscay. Based on the high precision U-series dating the corals spans a growth period of ~60 years. Pre- and postbomb $\Delta^{14}\text{C}$ showed quasi-decadal oscillations between -36 to -65‰ and -28 to 5‰ respectively. Those variations are most likely related to a competition between mid-depth subtropical gyre water vs. northward propagating Mediterranean Sea Water (MSW) in close association to modifications of the North Atlantic Oscillation. These results confirm the link between atmospheric circulation and intermediate depth ocean response observed from hydrographical data (Lozier and Stewart, 2008; Bozec et al., submitted JGR). The Nd-isotopic composition (ϵNd) was measured to characterize water mass origin and in particular the northward transport and evolution of Mediterranean Sea water and the potential eastward penetration of temperate and subpolar North Atlantic water. Within the Bay of Biscay North Atlantic Central water and MSW are almost indistinguishable with ϵNd values ranging from -11.7 to -11.6 (Copard et al., submitted G-Cubed). The coral ϵNd values ranged from -11.9 to -10.5 within ranges of both water masses. ^{14}C increases are accompanied by a tendency to higher ϵNd providing clear evidence of enhanced northward transport of MSW. Finally, temperature trends as derived from the corals Li/Mg ratio are in well agreement within uncertainty with patterns of temperature anomaly in the Bay of Biscay during the past 60 years (Reverdin et al., 1994). Thus, our coral provides a unique record of the past 60 years hydrography in the Bay of Biscay.

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