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Origin of the deepest NW Atlantic water masses during the Last Glacial Maximum

Frerk Pöppelmeier (1), Marcus Gutjahr (2), Patrick Blaser (1), Lloyd D. Keigwin (3), and Jörg Lippold (1)

(1) Heidelberg University, Institute of Earth Sciences, Heidelberg, Germany (frerk.poeppelmeier@geow.uni-heidelberg.de), (2) GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany, (3) Department of Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, USA

The notion of a shallow northern-sourced intermediate water mass is a well evidenced and widely accepted feature of the Atlantic circulation scheme during the Last Glacial Maximum (LGM; e.g. [1,2]). However, recent observations from stable carbon isotopes (δ13C) at the Corner Rise in the deep North West Atlantic suggested a significant contribution of a Northern Component Water mass to the abyssal (> 5000 m water depth) North West Atlantic basin that has not been described before [3]. Here we test the hypothesis of this northern-sourced water mass underlying the southern-sourced Antarctic Bottom Water by measuring the neodymium (Nd) isotopic composition from the identical sediment material. Neodymium isotopes act as a water mass tag capable of distinguishing between Northern and Southern Component Waters at the North West Atlantic (e.g. [4]).
Our new Nd isotopic record resolves various water mass changes from the LGM to the early Holocene in concert with existing Nd based reconstructions from all over the West Atlantic Ocean. For the LGM we found evidence for a northern-sourced water mass contributing to abyssal depth, thus being in agreement with the previous δ13C data. Overall, however, the deep North West Atlantic was still dominated by southern-sourced water, excluding the possibility of a distinct northern-sourced water mass. Furthermore, this new record indicates that carbon and Nd isotopes are partly decoupled, hinting to non-conservative behavior of one or more likely of both water mass proxies during the LGM.

References:
[1] Sarnthein et al. (1994), Paleoceanography 9, 209-267; [2] Curry and Oppo (2005), Paleoceanography 20 (1); [3] Keigwin and Swift (2017), PNAS 114 (11), 1-5; [4] Roberts et al. (2010), Science 327, 75-78.