Multiproxy evidence from Bermuda Rise for Holocene AMOC stability

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The Atlantic Meridional Overturning Circulation (AMOC) is one of the most important components in the climate system. One main focus in modern Paleoceanography is the investigation of past climate perturbations in order to assess the consequences of large ice-sheet melting events on AMOC stability and resilience. Indeed, past climate episodes provide a broad range of natural experiments under various climatic boundary conditions and proxy data from deep-sea sediments revealed a high AMOC variability in down-core profiles. In contrast, there has yet been less interest in the variability of the AMOC during the most recent warm period, the Holocene, which has been assumed to be relatively stable. In order to predict the future of the AMOC under a global warming regime, however, it is advisable to study its variability under climatic boundary conditions similar compared to today. Here, we present a Holocene multi-proxy, high-resolution record from the Bermuda Rise, a region which has been intensively studied in terms of glacial-interglacial and deglacial circulation patterns [1-8]. New combined measurements of $^{231}Pa/^{230}Th$, ε_{Nd}, ^{14}C, opal flux and benthic foraminiferal $\delta^{13}C$ from identical sample material help reconstruct AMOC variability at sub-millennial resolution. Besides providing new key insights towards Holocene overturning strength and water-mass sourcing, our records also serve to better understand and "intercalibrate" the individual proxies and to asses their applicability, potentials and shortcomings from a direct comparison.

[1] Deaney, E. et al. Nature Comm. 8, 14595, (2017).
[2] Henry, L. G. et al. Science 353, 6298, (2016).
[3] Böhm, E. et al. Nature 517, 73-76, (2015).
[4] Gutjahr, M. & Lippold, J. Paleoc. 26, PA2101, (2011).
[5] Roberts, N. et al. Science 327, 75-78, (2010).
[6] Lippold, J. et al. Geophys. Res. Lett. 36, L12601, (2009).
[7] McManus, J. et al. Nature 428, 834-837, (2004).
[8] Keigwin, L. Paleoc. PA4012, (2004).