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Holocene Variability of the AMOC as derived from $^{231}Pa/^{230}Th$

JÖRG LIPPOLD[1], MANUEL EHNIS[1], DR. FINN SÜFKE[1], SASKIA TAUTENHAHN[1], OLE VALK[1], PATRICK BLASER[2], FRERK PÖPPELMEIER[3] AND MARCEL REGELOUS[4]

[1]Heidelberg University

[2]University of Lausanne

[3]University of Bern

[4]GeoZentrum Nordbayern, Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg

Presenting Author: joerg.lippold@geow.uni-heidelberg.de

Climate models and paleo-reconstructions indicate that changes to the Atlantic Meridional Overturning Circulation (AMOC) both herald and drive climate shifts. The AMOC is further considered a central tipping element in the climate system. Although there is a general understanding that AMOC variability was suppressed during the Holocene compared to e.g. the last glacial termination, proxy evidence is often contradictory. Discrepancies remain regarding the timing, overall trend, and amplitude of North Atlantic deep-water production. Within this context, we assess the variability of the AMOC during the Holocene based on several marine sediment cores from the North Atlantic in high temporal resolution using the $^{231}Pa/^{230}Th$ proxy that indicates bottom water advection strength and has been previously applied mainly to older time periods. We hence aim for better connecting the paleo-circulation reconstructions of the last deglacial with more recent paleo-data. Along with $^{231}Pa/^{230}Th$ we also reconstruct the down-core history of particle fluxes, as its variability and composition may exert a non-negligible effect on sedimentary $^{231}Pa/^{230}Th$. Five high-resolution $^{231}Pa/^{230}Th$ down-core records from different oceanographic settings and water depths in the North Atlantic show consistently low variability throughout the Holocene. No distinct increase or decrease in $^{231}Pa/^{230}Th$, and hence AMOC strength, is found. In particular, no significant excursion is found around the prominent 8.2k –event, which was characterized by abrupt cooling across large parts of the Northern Hemisphere. The observed overall variability in $^{231}Pa/^{230}Th$ over the last 11 ka is limited to variations differing from the long-time average in the range of up to 20 %. Despite using high-sedimentation sites the resolvable AMOC variations are limited to events longer than ~200 years due to inherent proxy and analytical uncertainties.