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A high resolution coccolithophore record of interglacial surface water variability from the Mid-Atlantic Ridge

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The response of coccolithophores to changes in the Atlantic Meridional Overturning Circulation (AMOC) in the Azores Current system was investigated in detailed and well dated sediment cores from the Mid-Atlantic Ridge (MAR) southwest of the Azores Islands (38°N/31°W). The observed changes in the coccolith assemblage may be either caused by shifts in the position and/or strength of the Azores Current regime, as also evidenced in pronounced SST, SSS and nutrient inventory fluctuations.

Two cores recovered from a small basin at the Mid-Atlantic Ridge (AMOCINT cruise MD 168, 2008), today situated underneath the transition zone between the oligotrophic Subtropical Gyre and the more productive North Atlantic Transitional Waters, provide early Holocene and deglacial sedimentation rates up to more than 70 cm/kyr. Today the site is characterized by relatively low surface productivity accordingly accumulation of biogenic material is only moderate. Substantial phytoplankton production takes place during early spring, when winter mixing relaxes and stratification sets in.

An array of independent paleoproductivity proxies shows that productivity was considerably increased during cooler intervals (e.g.Younger Dryas) which enhanced the biogenic particle flux. This applies also to the short lived 8,2 kyr event as identified in the SST record. In general cold water species then (e.g. C. pelagicus, G. muellerae), today nearly absent from the site, occur significantly. Oppositely F. profunda, an indicator for low productivity, shows peak abundance during the late Holocene. The coccolith based paleoproductivity reconstructions are supported by geochemical proxies (e.g. XRF Ba/Ti and Si/Ca ratios) exhibiting pronounced peak maxima during cold fluctuations.

Pronounced changes in the productivity and hydrographic regimes suggest that the Azores Current system is highly sensitive to AMOC variability. Changes in the Azores Current system appear to be precisely in phase with changes in similar magnitude reported from the high latitude Northern Hemisphere. Therefor Northern Hemisphere climatic signals seem to penetrate far more south than previously thought.