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Mid-Holocene AMOC weakening induced 4°C temperature drop in Southeast Asia

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In contrast to Holocene transient climate models, terrestrial proxy temperature reconstructions typically show larger multi-millennial to centennial variability. While unidentified seasonal biases are problematic to resolve the cause of their variability, cave proxy temperature reconstructions can circumvent seasonality issues if supported by cave monitoring data. Here we present a Holocene speleothem TEX_{86} mean annual temperature reconstruction from monitored caves in mainland southeast Asia (MSEA) and examine its relation with the Atlantic Meridional Overturning Circulation (AMOC). We observe a Mid-Holocene thermal maximum at ~5.8 Ka BP and a subsequent ~4°C cooling, that is not present in other temperature reconstructions. Recently published records demonstrate that this cold phase is contemporaneous with a regional megadrought. We show that the Mid-Holocene cold-dry period is also in-phase with a weakening of the AMOC and can be explained with a suite of published and new climate model sensitivity simulations. Subpolar North Atlantic cooling shifted the jet stream south and strengthened the East Asian winter monsoon. The collapse of Saharan vegetation and associated aerosol feedbacks reinforced the MSEA cooling that was further exacerbated by a reduction in local vegetation productivity. Our findings show the existence of strong Atlantic - tropical teleconnections during the Holocene. Projected future weakening of the AMOC could therefore lead to reduced warming and increased drying in MSEA.