Is Arctic climate change driving the slow-down of the Atlantic meridional overturning circulation?

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One of the consequences of ongoing climate change is the rapid retreat of Arctic sea ice that occurred over the past several decades. This sea ice loss exposes the ocean to additional heat and freshwater fluxes, generating positive anomalies in surface buoyancy fluxes over the Arctic. In this study, using an optimal flux perturbations framework, we estimate the sensitivity of the Atlantic meridional overturning circulation (AMOC) to changes in surface buoyancy forcing over the Arctic and globally. We find that, whereas on a decadal timescale the subpolar North Atlantic region, specifically south and east of Greenland, is the primarily driver of the AMOC weakening, on multi-decadal timescales (20 years and longer) it is the Arctic region that largely controls the AMOC intensity. On these longer timescales Arctic surface buoyancy fluxes are nearly twice as effective for weakening the AMOC as those in the North Atlantic. It is important that anomalous surface fluxes in the Arctic act to weaken ocean poleward heat transport in the entire Atlantic, which can explain the so-called "Warming Hole" in the subpolar North Atlantic typically attributed to the AMOC decline. A suite of further numerical experiments using a global climate model (CESM), in which we closely replicate the observed sea ice retreat, and an analysis of CMIP5 global warming projections confirm that the remote control of the AMOC intensity and heat transport from the Arctic is indeed a robust feature of global climate change.