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# Enhanced melting of the Greenland ice sheet and its impact on the Subpolar North Atlantic and AMOC

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Freshwater (FW) fluxes from river runoff and precipitation minus evaporation for the pan Arctic seas are relatively well documented and prescribed in ocean GCMs. Fluxes from Greenland on the other hand are generally ignored altogether, despite their potential impacts on ocean circulation and marine biology. Here, we present a reconstruction of the spatially distributed FW flux from Greenland for 1958-2010. We find a modest increase into the Arctic Ocean during this period. Fluxes into the Irminger Basin, however, have increased by fifty percent (6.3±0.5 km̂3 yr-2) in less than twenty years. This greatly exceeds previous estimates. For the ice sheet as a whole the rate of increase since 1992 is 16.9±1.8 km̂3 yr-2, which is eight times larger than the long term trend for Eurasian rivers.

To investigate the impact on ocean dynamics, we force an eddy-permitting global ocean-sea ice model with the FW flux anomalies extended to 2020 based on current trends. Upon invading the surface waters of the subpolar North Atlantic, the additional FW leads to a gradual suppression of deep winter convection in the Labrador Sea, inducing a ten percent weakening of the large-scale meridional overturning circulation. Surface salinity in Baffin Bay is reduced as FW accumulates in the region before being advected by an outflow by the shallow Labrador Current along the continental slope. The FW then begins to spread over the surface waters of the interior Subpolar North Atlantic. Our results suggest that the trends in Greenland FW fluxes in the last twenty years have already begun to significantly influence the circulation and hydrography of the North Atlantic.