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# Impacts of the observed melting of Greenland ice sheet and Arctic land ice over the North Atlantic in a climate model

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The Atlantic Overturning Meridional Circulation (AMOC) is a fundamental contributor to the ocean influence on climate, related to dense water formation in the Labrador Sea. Some hints of a weakening of the AMOC in the recent decades have been recently reported. This goes along with an observed change in the freshwater budget of the Arctic and sub-polar North Atlantic Oceans and a decrease in the Labrador Sea deep water production. Nevertheless, no simulation from coupled ocean-atmosphere model has been performed to quantify the potential impact of this observed change in the North Atlantic freshwater budget. Here, we use a recent reconstruction of observed melting of Greenland Ice sheet and Arctic land ice to force an ensemble of historical simulations from the new IPSL-CM6A climate model. The reconstruction consists in a monthly combination of satellite observations of solid ice discharge with regional climate modelling of ice and land runoff for the period 1958-2014. The forced freshwater flux is extended to the period 1920-2014, to include the large Greenland ice loss of the 1920s, using an annual Greenland ice sheet mass balance reconstruction. To account for the drifting of the icebergs, the solid ice discharge due to iceberg melting is spread over the North Atlantic using the observed spatial distribution of the Altiberg project. The freshwater forcing computed by the model is replaced with this observation-based estimate in terms of anomalies. We thus assess in the simulations the effect of the tendency of runoff and icebergs melting over the historical period since 1920. Salinity anomalies and mixed layer depth evolutions in the simulations are analysed to understand the impact of the recent accelerated melting on the North Atlantic waters. Furthermore, the impact on the strength of the AMOC at several latitudes is evaluated. Finally, we explore the potential link between the trend in freshwater input and recent observational estimates of the trends in North Atlantic sea surface salinity over the last century.