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Recent large increases in freshwater fluxes from Greenland into the North Atlantic

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Freshwater fluxes (FWF) from river runoff and precipitation minus evaporation for the Arctic and North Atlantic Oceans are relatively well documented and prescribed in ocean GCMs . Fluxes from Greenland, which, historically, amount to about 0.02 Sv, on the other hand are generally ignored altogether due to a lack of reliable estimates for their behaviour in time and space. These fluxes, however, lie close to the two main regions of overturning circulation in the North Atlantic—the Irminger and Labrador Seas—and it has been suggested they could influence the strength of the thermohaline circulation. Here, we present a reconstruction of the spatially distributed FWF from Greenland for 1958-2008 using a combination of regional climate modelling and observations of ice discharge. We find that the FWF into the Arctic Ocean has increased only slightly during this period. Fluxes from southeast Greenland into the Irminger Sea, however, have increased markedly during the 1990s at a rate of 0.21 mSv/yr (6.6 kmˆ3 yrˆ-2). This is more than three times the value reported for the largest Eurasian rivers combined (2 kmˆ3 yrˆ-2) 1. For the ice sheet as a whole the rate of increase since 1996 is 0.65 mSv yrˆ-1 (20 kmˆ3 yrˆ-2) with an acceleration in the rate since about 2000. In recent years, the peak summer FWF has approached 0.1 Sv. The large increases in FWF are likely to have important consequences for local and regional ocean circulation, the marine ecosystem, freshwater budget and surface chemistry of the region.