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First glance on simulated fresh water releases around Greenland's coast and its impacts on the ocean circulation

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In a warming world increased ocean ice sheet interaction and enhanced surface melting will led to an additional fresh water flux from Greenland into the surrounding coastal ocean. To identify robust features of the ocean's response, a prescribed fresh water flux of 0.1 Sv along the greenlandic coast has been simulated in both ocean-only (NEMO/DRAKKAR, NEMO-DMI) and coupled climate models (IPSL-CM5, HadCM3, BCM, ECHAM6/MPI-OM). Our preliminary analysis highlights the spreading paths of the additional fresh water: In most models the fresh water anomaly flows predominately into the Labrador Sea and heads afterwards into the subpolar Atlantic. There the signal splits into two branches. One takes a route towards the equator and the other one flows into the Greenland-Island-Norwegian (GIN) Sea. A common feature is a distinct warming of the SST after four decades in the northern GIN Sea. A quantitative analysis shows for most models a decrease of the overflow water mass densities after several decades. Also volume, that is enclosed by the deep reaching convection during winter, decreases for the key deep water production sites, namely Labrador Sea and the GIN Sea. However in some models is the amplitude of the latter signal as large as the underlying variability. The reduced overflow densities and ventilated volumes explain the meridional overturning circulation (MOC) reduction at 36°N. The reduction ranges typically from 0.5 to 5 Sv and is independent of the absolute MOC strength in the undisturbed case. Further analysis are required to assess the different model results and to obtain a more consistent picture of the uncertainties.