



## **Mechanisms of changes in the subpolar freshwater budget: model results**

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Recent studies show a significant freshening of the Subpolar Gyre in the North Atlantic and in the Nordic Seas during the last decades of the 20th century. Several mechanisms have been proposed to explain single aspects of that freshening, including surface freshwater fluxes as well as the lateral import of fresh water out of the Arctic and the exchange of salt with the Subtropical Gyre.

Based on a hierarchy of sensitivity experiments with realistic and simplified forcing conditions for the period 1958-2000, using the global NEMO ocean-sea-ice model framework, we have assessed the freshwater budget for the subpolar North Atlantic. The model simulations captures the observed changes in both the integrated freshwater content and in the salinity in the deep Labrador Sea at OWS Bravo. The model indicates a minor role of fluctuations in the surface fluxes and a secondary contribution by anomalous freshwater exports from the Arctic; instead, it suggests the salt and freshwater exchange with the Subtropical Gyre as largest source for the subpolar freshwater content changes. The variability in the subtropical-subpolar freshwater flux can be understood in terms of the dynamical response of the gyre circulation to the large scale atmospheric forcing, implying a strong relation between the multi-decadal changes in the subpolar freshwater content and the North Atlantic Oscillation index.