



Variability of the Arctic ocean freshwater content and exports: a model-based synthesis

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We investigate the variability of the Arctic freshwater content during the 1965–2002 period using the DRAKKAR global ocean/sea ice model with high resolution in the Arctic (10 km grid). A comparison with recent mooring sections shows that the model realistically represents the major advective exchanges with the Arctic basin, through Bering, Fram and Davis straits, and the Barents Sea. This allows the separate contributions of the inflows and outflows across each section to be quantified.

In the model, the Arctic freshwater content variability is explained by the ice flux at Fram and the combined variations of ocean freshwater inflow (at Bering) and outflow (at Fram and Davis). At all routes, except through Fram Strait, the freshwater transport variability is mainly driven by the ocean, with small contributions from the ice flux. The ocean freshwater transport variability through both Davis and Fram is controlled by the variability of the export branch (Baffin Island Current and East Greenland Current, respectively), the variability of the inflow branches playing a minor role.

We examine the respective role of velocity and salinity fluctuations in the variability of the ocean freshwater transport. Fram and Davis straits offer a striking contrast in this regard. Freshwater transport variations across Davis Strait are completely determined by the variations of the total volume flux (0.91 correlation). On the other hand, the freshwater transport through Fram Strait depends both on variations of volume transport and salinity. As a result, there is no significant correlation between the variability of freshwater flux at Fram and Davis, although the volume transports on each side of Greenland are strongly anti-correlated (-0.84). Contrary to Davis Strait, the salinity of water carried by the East Greenland Current through Fram Strait varies strongly due

to the ice melt north of Greenland.