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The Arctic Ocean Freshwater Content and Fluxes into the North Atlantic: 1979-2003 Model Results

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The Arctic Ocean has been warming since the 1990s. The warming appears to have accelerated during the last several years as observed by satellites and in situ measurements and as simulated by models. The main manifestation of this trend has been a decrease of the summer ice cover, which through positive ice-albedo feedback leads to further ice reductions and subsequent increases of freshwater export into the active convection regions in the North Atlantic.

To investigate the variability of sea ice and freshwater fluxes into the North Atlantic we use a high resolution coupled ice-ocean model of the Pan-Arctic region forced with realistic atmospheric data for 1979-2003. Model results suggest that the decrease of the total sea ice volume and the subsequent increase of freshwater content controlled by air-sea-ice interactions in the Arctic Ocean, translate into the increased total freshwater export into the North Atlantic. This trend, if continued, will introduce large amounts of ice-melt derived freshwater into the northern North Atlantic. Such changes will have major consequences on the ocean thermohaline circulation as well as on the long-term ocean heat and salt transports.