



Freshwater Variability in the Arctic Ocean and Subpolar North Atlantic: a Comparison from the 1990s to Present

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A significant increase in liquid freshwater content has been observed in the Arctic Ocean over the last 20 years, whereas the Arctic sea ice volume shrank significantly. In contrast, the North Atlantic became more saline in recent years. Both regions are of great importance for the global ocean circulation and climate, and salinity changes may have a profound impact on the global climate.

We found that for the period between 1992 and 2013, the liquid freshwater content of the subpolar North Atlantic, calculated from objectively mapped in-situ salinity measurements, and the total freshwater content of the Arctic Ocean, i.e. the liquid freshwater content and freshwater stored in sea ice, are significantly negative correlated ($r=-0.77$). Moreover, the amount of the anomalies are of the same size. Furthermore, the time series hint at multi-decadal oscillations. The highest negative correlation with the total freshwater content of the Arctic Ocean can be found in the Irminger and Labrador Seas, while we observed a positive correlation east of the Mid-Atlantic Ridge at the path of the North Atlantic Current, which is the source of Atlantic Water entering the Arctic Ocean through the Nordic Seas.

We suggest a redistribution of freshwater as a response to frequent changes in atmospheric pressure patterns. Under certain conditions the freshwater is re-routed and kept in the Arctic Ocean, while it is released under other conditions. We conclude that decadal scale changes of the freshwater content in the North Atlantic, particularly those in the deep water formation sites like the Labrador Sea, are originating in the Arctic Ocean.