



Atlantic Water variability in the 20th century Arctic Ocean from observations, climatology and a global ocean model.

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Warm and salty Atlantic Water enters the Arctic Ocean through the Fram Strait and the Western Barents Sea. The Atlantic Water has a direct impact on the sea ice cover in regions north of Svalbard.

Both historical observations and outcome from a fully coupled earth system model show a warming trend in core temperature of this Atlantic Water inflow over the last few decades (1977-2015). For example, the upper 50-200m of the West Spitsbergen Current shows an observed overall warming of 1.1 [U+0366]C since 1977. A portion of this recent large warming has been attributed to current global warming and possibly anthropogenic activity. However, low frequency oscillations (50-80 year time-scale) in Atlantic Water temperature have been documented. Over the twentieth century, the Atlantic Water temperature records from observations show two warm periods, in the 1930s-40s and in recent decades, and two colder periods, early in the 1900s and in the 1960s-70s. For example, north of Svalbard the Atlantic Water was as warm as in 2015, during the Nautilus expedition in 1931.

We believe that the Atlantic Water warming trend in the Arctic Ocean may be part of long-term multidecadal variability, which is influenced and reinforced by strong anthropogenic forcing. In this work we investigate this long term variability and discuss its relative contribution to the recent warming trend by using a global ocean model.

Simulations for the period 1871-2009 with the ocean-sea ice component of the Norwegian Earth System Model (NorESM-O) were forced by a Twentieth Century Reanalysis data set. Atlantic Water characteristics in these simulations are compared to available observations in a region north of Svalbard. Amongst these observations are hydrography measurements obtained during the Norwegian Young Sea Ice Cruise (N-ICE2015). Atlantic Water pathways in the Arctic Ocean for the period from 1871 to 2009 will also be presented as part of this study.