



Can changes in the atmospheric circulation make Atlantic Water available for melting Arctic sea ice?

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At the moment the Arctic sea ice is shielded from the warm Atlantic water at mid-depth by a well-developed halocline. If the heat content of the Atlantic layer would become available to the surface of the ocean, that could impact the development of the ice cover enormously.

Coupled climate models contributing to the 4th assessment report of the IPCC project an ice free Arctic until the end of this century with this halocline either intact or even thickened. However, given the large sea ice extent reductions in recent years and the apparent inability of most climate models to reproduce the recent sea ice decline, we are exploring mechanisms that could weaken or even dissolve the halocline within a few decades. Before substantially increased fresh water input through precipitation and run-off can strengthen the halocline later in the 21st century, there is the possibility that changing atmospheric pressure patterns can redistribute fresh water such that the halocline in certain areas becomes weak enough to allow tapping of the Atlantic heat reservoir. To investigate this possibility we use experiments with an ocean-sea ice model (NAOSIM) and an atmospheric forcing that reflects e. g. the increasing importance of the Arctic Dipole sea level pressure pattern compared to the annular mode.