

Predictability of the rapid warming of the North Atlantic in the mid-1990s and its climate impacts

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In the mid 1990s the North Atlantic underwent a significant warming. The warming was especially clear in the subpolar gyre of the North Atlantic, which underwent an abrupt warming following the winter of 1995/1996. Previous studies have shown that the ocean heat transport, largely driven by a strengthening of the Atlantic Meridional Overturning Circulation (AMOC) in reaction to the positive North Atlantic Oscillation (NAO) in the late 1980s and early 1990s, very likely played a significant role in the warming.

The importance of the ocean preconditioning by the positive NAO prior to the warming suggests that the warming could have been predicted in advance. Thus, to understand the predictability of this event we examine hindcast predictions made with the UK Met Office's decadal prediction system (DePreSys). Analysis of the hindcasts suggests that DePreSys has remarkable skill, successfully predicting the warming years in advance. Also, it appears that the initialisation of a strong AMOC, and hence strong northward heat transport, was key in achieving the successful predictions. Finally, by comparing hindcasts made before and after the warming took place, DePreSys suggests that the warming of the North Atlantic, and changes in Pacific, had a significant impact on the wider climate of both Europe and North America, and that these impacts could have been predicted.