

An observed rapid warming of the North Atlantic in the 1990s

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The variability in the North Atlantic subpolar gyre is primarily driven by the variability in the North Atlantic Oscillation (NAO) through changes in buoyancy forcing and changes in the wind stress applied to the surface of the ocean. In the mid-1990s the subpolar gyre of the North Atlantic underwent a rapid warming, with sea surface temperatures increasing by around 1C in just 2 years. This rapid warming followed a prolonged positive phase of the NAO, but also coincided with an unusually negative NAO in the winter of 95/96.

By careful comparison between ocean analyses and idealised ocean model experiments we show that the rapid warming was very likely a delayed response to the prolonged positive phase of the NAO, and not simply an instantaneous response to negative NAO of 95/96. Furthermore, we infer that the warming was likely associated with a surge, and subsequent decline, in the northward heat transport of the Atlantic Ocean which was in part caused by a strengthening of the overturning circulation.