

Title: Recent subpolar Atlantic climate shift due to wind forcing of midlatitude gyre circulation

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Abstract: The subpolar North Atlantic (SPNA) is characterized by considerable decadal variability, with implications for surface climate and predictability. Since roughly 2005, there has been a marked reversal of decadal temperature trends in the SPNA, with strong warming observed over 1994-2004, and enhanced cooling during 2005-2015. Based on hydrographic data in the Labrador Sea, and correlation analysis of climate model output, this pronounced shift in SPNA climate has been related to anomalous ocean heat transport due to changes in the Atlantic overturning circulation in response to shifting conditions in the Labrador Sea. Using a kinematically and dynamically consistent state estimate, here we present results from closed budget analyses, demonstrating that ocean heat transports responsible for the SPNA trend reversal were in largest part due to horizontal midlatitude gyre circulations, and that these horizontal gyre circulation anomalies were tightly coupled to contemporaneous changes in the overlying wind field, implicating direct ocean response to local atmospheric conditions. Our findings point to limits to SPNA predictability, suggesting that the recent climate shift might have been difficult to foresee in advance.