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North Atlantic decadal variability in a coupled global model and relevance to observations

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This study focuses on the decadal time scale variability of the North Atlantic Ocean-Atmosphere system. This time scale is relevant to preparedness and adaptation as society becomes increasingly threatened by the adverse impact of anthropogenic climate change. North Atlantic decadal climate variability has been related to interaction between the subpolar and subtropical gyre and manifested in persistent multi-year SST and heat content anomalies and shifts in the latitude of the Gulf Stream/North Atlantic Current (GS/NAC). We apply a space-time analysis to annual, North Atlantic, upper ocean heat content (OHC) anomalies from the National Center for Atmospheric Research (NCAR), Community Earth System Model (CESM) long pre-industrial control run. The analysis reveals decadal anomalies associated with two patterns: a dipole centered on the GS/NAC, in the western side of the Basin that oscillates quasi-regularly, reversing its sign every of 6 to 7 years. The second pattern is centered in the eastern side of the basin and lags the first by about 5 years, implying that heat is transported between the subtropical and subpolar gyres. Analysis of surface windstress anomalies connected with these OHC fluctuations implies that the latter are forced by stochastic atmospheric variability. Further analysis compares the model patterns with observations to determine their relevance and predictability and assesses their response to climate change.