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Ocean variability and connections to the atmosphere in an ensemble of 1500 to 2000 AD simulations

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Persistent large-scale anomalies of sea surface temperature are linked with changes in the atmosphere. Thus, a better understanding of the processes that lead to such anomalies will help to increase the long-term predictability of the atmosphere. An important low-frequency mode of natural climate variability is the Atlantic multidecadal oscillation (AMO), a large-scale surface temperature anomaly in the North Atlantic that oscillates with a period of 50-80 years and an amplitude of a few tenths of a degree Celsius. The AMO influences the surface air temperature and precipitation over large areas in the Northern Hemisphere (e.g. in Europe and in North America) and it is associated with changes in the frequency of droughts and hurricanes.

Using the latest low-resolution version of the NCAR community climate system model (CCSM, version 3), an ensemble of four transient simulations from 1500 to 2000 AD and a 650-yr control simulation were conducted. These simulations are investigated with respect to multidecadal variability of the ocean, especially in the North Atlantic. This implies that we focus on the interaction between the ocean and the atmosphere. Preliminary results show in the control simulation that two multidecadal sea surface temperature oscillations in the North Atlantic exist. One has a 40-yr period and the other has a 120-yr period, the latter being more stable during the whole simulation, but less reliable as there are only five complete periods to be investigated. Two oscillations with similar periodicities (45 and 125 years) can also be found in the meridional overturning circulation, which implies a potential connection between the two phenomena. The goals of this study are to detect multidecadal oscillations and the processes that drive them, to compare the results for the transient simulations with the

control run and to investigate the connections of such oscillations to the atmosphere.