



Centennial modes in the Atlantic ocean due to solar variability during the Holocene

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Periodic century-scale variability in the Atlantic ocean was found in a coupled intermediate-complexity climate model, when solar irradiance forcing (as reconstructed from tree ring C14 data) for the Holocene period is imposed. Similar periodic signals have been found in proxy records from the circum-Atlantic region. In this study, we investigate the hypothesis that this ocean variability arises due to synchronization of the overturning circulation and the solar forcing. We use a 4-box model of the ocean circulation in a parameter regime for which it possesses a damped centennial oscillation under mixed boundary conditions for temperature and salinity. The addition of white noise to the temperature forcing does not excite any statistically significant oscillation. However, when a weak periodic component with a 200-yr period (as contained in the solar forcing record) is added to the forcing, relatively strong century time-scale variability occurs. A qualitative comparison between the box model results and those of the climate model shows encouraging similarities and provides support to the synchronization hypothesis.