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A multimodel comparison of the mechanism of centennial variability of the meridional overturning circulation

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Centennial variability of the Atlantic Meridional Overturning Circulation (MOC) is analysed in multimillennial control simulations with the 3rd Hadley Centre coupled climate Model (HadCM3) and the Kiel Climate Model (KCM). This encompasses approximately forty cycles of our models' centennial MOC oscillation, which has significant power at time-scales of around 120 years in HadCM3 and in KCM. Some support for variability at these centennial timescales comes from palaeo-reconstructions of the last 4500 years that have indicated a similar centennial periodicity in Sea Surface Temperatures (SSTs) North of Iceland which themselves have been linked to ITCZ variability Long period variability of the MOC may well be an important modulator of anthropogenically induced climatic changes, and its role in past abrupt climate change make understanding the centennial variability of vital importance. The length of our new simulations allows the detail of the centennial mechanism to be investigated as part of a systematic analysis of the similarities and differences in the mechanism between the two models. We show that, despite the length of time in which oceanic signals of MOC variability can remain apparent (for instance the slow northward propagation of Sea Surface Salinity (SSS) signals detected between equatorial regions and the subpolar gyre), the role of the atmosphere in the centennial mechanism is important. Atmospheric influences such as changes in the degree of precipitation within, and position of, the Inter-Tropical Convergence Zone (ITCZ) play a crucial role in switching the mode of oscillation from a positive to negative phase.