



North Atlantic meridional overturning circulation in a 1000-year climate model

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The North Atlantic meridional overturning circulation (MOC) is important for ocean heat transport in the Atlantic, so it is widely monitored and modelled. Previous work based on a few decades of model simulations has shown that the overturning north of about 40°N is quite different from that further south, and that changes in the circulation can be accurately monitored using pressure measurements at the western boundary, and reasonably well using tide gauge data. Here, we extend these analyses to 1000 years of data from the HadCM3 climate model Control run. In the northern band we find a decadal mode of variability, whilst to the south higher frequencies dominate, and the signal becomes coherent with the northern mode (with a few years lag) only at periods longer than about 10 years. In the deeper waters, especially at lower latitude and for the first few centuries of the model run, the signal is dominated by longer term trends. There is initially a strong increasing trend in the deep water overturning cell, which stabilises after several centuries. Spatial patterns associated with the transient are quite different from those produced by natural variability later in the run.