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# The Atlantic Multidecadal Oscillation: an internal mode of climate variability in the Northern Hemisphere

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An ensemble of simulations of 20th Century climate using the HadCM3 coupled climate model forced with estimates of natural and anthropogenic forcings is compared with instrumental temperature data sets. The results show that while external climate forcing can account for most of 20th century climate change, there are also significant multidecadal climate fluctuations that are not produced by forcings. A major part of this internal variability is the 'Atlantic Multidecadal Oscillation' (AMO), which is associated with fluctuations in temperature throughout most of the Northern Hemisphere. The observational record is too short, however, to show whether the AMO is permanent oscillation. As such, we examine results from a 1400 year HadCM3 climate simulation without external forcings. The simulation possesses an AMO with a similar pattern, amplitude and time scale to that observed, but which persists for many centuries, suggesting the AMO is a genuine long-lived climate phenomenon. Associated variations in Global, Northern Hemisphere and North Atlantic mean surface temperatures are found to be of significant size compared to observed 20th Century variability. In addition, the results show the simulated AMO is linked to variations in the strength of the thermohaline circulation (THC), and imply partial predictability of climate for several decades into the future. Support is also found for observed links with north-east Brazil and Sahel rainfall, and Atlantic hurricane formation.