North Atlantic internal decadal variability in HadGEM3

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Results are presented from an analysis of the AMOC in a version of the state-of-the-art Met Office Hadley Centre coupled land-ocean-ice-atmosphere climate model HadGEM3 that is under development. In particular we focus on characterising the variability, diagnosing mechanisms of change, and comparisons with observations. This model represents a step-change in resolution and dynamics from previous Hadley Centre models, using the NEMO ocean model at nominally 0.25° resolution and a new dynamical core in the atmosphere. These results represent the highest resolution multi-century simulation currently produced by the Hadley Centre. A control simulation is conducted with persisting present-day forcings to analyse internal modes of variability, with a focus on multiannual timescales up to a few decades. Initially the base climate is assessed, which reveals a simulated AMOC strength of 17 ± 1 Sv after the initial spin-up, in good agreement with observations, and a good representation of the overflows into the North Atlantic basin. Simulated heat transports in the Atlantic are within the range of reanalysis estimates but slightly less than direct measurements at 26.5N related to too shallow an upper AMOC cell. The extent to which mechanisms of interdecadal variability in the North Atlantic, previously found in other climate models, are robust in this higher resolution coupled model are assessed. The preferred modes of variability for this particular model are also identified. Comparisons against available observations are made throughout.