

Interannual predictions of the Atlantic Meridional Overturning Circulation at 26.5oN

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The Atlantic Meridional Overturning Circulation (AMOC) is an important contributor to European climate, which implies that the future strength of the AMOC is of considerable scientific and societal interest. In the near term (interannual to decadal), AMOC variations are influenced by both anthropogenic forcing and natural variability, and therefore near-term predictions need to be initialized from the current ocean state. We perform interannual AMOC predictions with the state-of-art coupled climate model ECHAM5/MPI-OM and compare these predictions with the only continuous observations of the AMOC at 26.5oN, which are provided by the RAPID/MOCHA project over the period April 2004 to March 2009. Our predictions are initialized from an ensemble of ocean-only experiments forced by NCEP-NCAR atmospheric reanalyses. We show that the interannual AMOC variations at 26.5oN are predictable up to 4 years in advance, with considerably increased skill compared to both non-initialized simulations and persistence forecasts. Investigating the predictability of different AMOC components, we find that the predictive skill arises predominantly from the basin-wide upper-mid-ocean geostrophic transport. Our initialized ensemble forecasts starting in January 2008 indicate that no substantial weakening of AMOC is to be expected over the next five years. The predicted amplitude of the AMOC annual cycle undergoes interannual modulations, with a reduction in amplitude in the first two years followed by a gradual recovery thereafter.