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Interannual predictions of the Atlantic Meridional Overturning Circulation at 26.5ºN

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Most IPCC AR4 global coupled models simulate a slow down of the Atlantic Meridional Overturning Circulation (AMOC) under global warming conditions, however the degree and timing of the reduction remain unclear. At shorter timescales (interannual to decadal), AMOC variations are influenced by both anthropogenic forcing and natural variability, and therefore the near-term predictions need to be initialized from the current ocean state.

Here we present for the first time a direct comparison of near-term predictions performed with an state-of-art coupled climate model (ECHAM5/MPI-OM) with the continuous observations of the AMOC strength at 26.5ºN provided by the RAPID/MOCHA project over the period April 2004-March 2009. To avoid difficulties with the sparse historical sub-surface ocean observations, we initialize our predictions 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 a considerable increased skill over non-initialized predictions and persistence forecasts. Investigating the predictability of different AMOC components, we find that the predictive skill comes predominantly from basin-wide upper-mid ocean geostrophic transport. Our initialized ensemble forecasts started in Jan 2008 indicate that no substantial weakening of AMOC is to be expected over the next five years. The amplitude of the AMOC annual cycle undergoes interannual modulations: a reduction in amplitude in the first two years, followed by a gradually recovery thereafter.