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Analysis of the decadal predictability of the North Atlantic volume and heat transport in a future climate projection

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The North Atlantic ocean is predicted to change considerably with climate change. An analysis of the North Atlantic meridional overturning circulation (AMOC) and the meridional heat transport (OHT) in CMIP5 climate projections in the global coupled Max Planck Institute Earth System Model (MPI-ESM-LR) has shown potential changes in the AMOC's and OHT's seasonal cycle in a future climate. From the CMIP5 historical simulation to RCP4.5, both the AMOC and the OHT indicate latitude dependent temporal shifts of about 1 month until 2050.

Based on these results, we here examine potential changes in the decadal predictability of the AMOC and OHT under climate change. In MPI-ESM-LR, we generate two hindcast ensembles with 20 start dates and 10 ensemble members per start date for (i) the current climate state in the CMIP5 historical simulation starting in 1995 and (ii) a future climate state in RCP4.5 starting in 2045. These two hindcast ensembles are compared against the historical simulation and RCP4.5 as control simulation, respectively, using anomaly correlation, root-mean-square error (RMSE) and the Brier skill score decomposition. We investigate whether the decadal predictability of the AMOC and OHT might change under future climate conditions both for the annual mean and individual seasons or climate indices (e.g. for the NAO).