The MPI-M CMIP5 Decadal Prediction Experiments

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The latest version of the MPI-M Earth System Model (MPI-ESM) decadal predictions provided for the 5th coupled model intercomparison project (CMIP5) is examined. Two suites of decadal hindcasts experiments performed with two different versions of the MPI-ESM coupled model (MPI-ESM-LR and MPI-ESM-MR) are considered and compared with their respective historical and assimilation runs. The assimilations are performed by nudging the 3-dimensional fields of salinity and temperature obtained from an NCEP forced MPIOM simulation. The hindcast procedures take into account yearly and 5-yearly initialisation.

The prediction skill is estimated for surface temperature (SAT) against the HadCRUT3v observational data set. We assess the potential predictability of the Atlantic Meriodonal Overturning Circulation (AMOC) comparing hindcasts with their respective assimilation runs. Both sets of initialized decadal hindcasts exhibit a substantial reduction in North Atlantic SST RMSE for all lead times when compared to their historical simulations. This holds in particular for the region of the sub-polar gyre. North Pacific sea surface temperature and global mean temperature show skill only for the first year and a strong increase in RMSE for subsequent lead times. Over land, some SAT skill improvement is found over north-western Europe and central-eastern Asia. AMOC variations show a higher level of potential predictability in the MPI-ESM-LR hindcasts.