DKT Abstracts
DKT-10-94, 2015
10. Deutsche Klimatagung

Predictability of the Atlantic meridional overturning circulation at 26.5°N in three differently initialized hindcast ensembles

M. Zeller (1), S. Brune (1), H. Pohlmann (2), D. Matei (2), J. Marotzke (2), V Müller (3), W. Müller (2), and J. Baehr (1)

(1) Institute of Oceanography, University of Hamburg, Hamburg, Germany, (2) Max Planck Institute for Meteorology, Hamburg, Germany, (3) Institute of Environmental Physics, University of Bremen, Bremen, Germany

As the Atlantic meridional overturning circulation (AMOC) is responsible for the major share of the Atlantic ocean's meridional heat transport, there is a considerable interest in predicting the AMOC's decadal variability. We investigate hindcast skill for the AMOC in three prediction systems based on the MPI-ESM global climate model and developed within the MiKlip framework. All three prediction systems use the same model setup, full-field nudging to re-analysis in the atmosphere, and only differ in their ocean initialization method: (i) in baseline-1, anomalies from a re-analysis are nudged into the oceanic component, (ii) in prototype, full-field nudging is applied to the oceanic component based on a re-analysis, and (iii) in the enKF-initialization, oceanic temperature and salinity observations are assimilated into the oceanic component using an ensemble Kalman Filter (enKF). For each prediction system, a hindcast ensemble is analysed, and hindcast skill is calculated with reference to the now 10 years spanning time series of 26°N AMOC observations (RAPID/MOCHA). Hindcast skill is quantified using root-mean square error and anomaly correlation for time series with the seasonal cycle removed. As previous systems, all three prediction systems show AMOC hindcast skill up to 5 years. The enKF-initialization outperforms the other two (nudging-based) prediction systems baseline-1 and prototype for lead times up to lead year 4. The improvement of the enKF-initialization over the two (nudging-based) prediction systems is particularly evident in lead year 1. Excluding the Ekman component from the AMOC results for all three prediction systems in higher hindcast skill, though particularly in the enKF-initialization in the first lead year. We also investigate the role of the initialization method in relating the AMOC's hindcast skill to the hindcast skill of the zonal density difference across 26.5N.