Comparison of surface freshwater fluxes from different climate forecasts produced through different ensemble generation schemes.

V. Romanova (1), A. Hense (1), S. Brune (2), and J. Baehr (2)

(1) Meteorological Institute, University of Bonn, Germany (romanova@uni-bonn.de), (2) Institute of Oceanography, University of Hamburg, Germany

The decadal variability of the surface net freshwater fluxes is compared in four different sets of retrospective predictions, all using the same model setup, and only differing in the implemented ocean initialisation method and ensemble generation method. All ensemble generation methods are implemented into the MPI-ESM earth system model in the framework of the ongoing MiKlip project (www.fona-miklip.de). Hindcast experiments are performed for 5 years, starting in the year 2000 with 10 ensemble members. Four different ensemble generation methods are compared: (i) a method based on the Anomaly Transform method (Romanova and Hense, 2015) in which the selected set of initial oceanic perturbations are designed such that they pick-up orthogonal and balanced anomaly structures in space and time and between the variables, (ii) one-day-lagged ocean states from the MPI-ESM-LR baseline system (iii) one-day-lagged of ocean and atmospheric states with preceding full-field nudging to re-analysis in both the atmospheric and the oceanic component of the system - the prototype MPI-ESM-LR system, (iv) an Ensemble Kalman Filter (EnKF) implemented into oceanic part of MPI-ESM (Brune et al. 2015), assimilating monthly subsurface oceanic temperature and salinity (EN3) using the Parallel Data Assimilation Framework (PDAF). The hindcasts are compared on a global scale to purely satellite-based HOAPS freshwater flux estimates and the NCEP atmospheric re-analysis to assess the quality of the initialization method. By testing the impact of the different ensemble generation methods on the hindcast experiments performed with the consistent framework of the coupled climate model, we also aim to give an approximation of the uncertainties of the net freshwater fluxes, which up to now appear to be the most uncertain products in observational data and model outputs.