Geophysical Research Abstracts
Vol. 17, EGU2015-3346, 2015
EGU General Assembly 2015

Breeding technique for initializing global coupled climate model for decadal climate prediction

Vanya Romanova and Andreas Hense
Meteorological Institute Uni Bonn, Berlin, Germany (romanova@uni-bonn.de)

Defining the uncertainties at the starting day of a hindcast is still problematic and there is no well established method from weather forecasting, which could be applied directly by the decadal forecast community. The success of proper initialization depend mainly on finding of the locations and strengths of uncertainties, which develop and grow fastest with the forecast time. One method widely used for a short and medium range forecast is the Bred Vectors (BV) technique. Here, we test the BV for a long-range, inter-annual, seasonal and decadal forecast.

The applied a-priori random noise is bred over the time iteratively until the nonlinear fastest growing errors are extracted. The growth rates of these non-linearly filtered instabilities appear to approach the leading Lyapunov exponents (Toth and Kalnay, 1993) if the BV process is continued over a longer time period. Targeting decadal prediction we search only for the slowest modes of the ocean physical processes, and expect the disturbances to grow mainly in the Western Boundary Currents, in the ACC and ENSO regions. Therefore we implemented a BV variant which determines local BV around an almost fixed in time oceanic state. The breeding technique is build around the MPIOM-ESM coupled model at T31L31/GR30L40 resolution. Perturbations are applied on the ocean temperature, salinity, meridional and zonal components of the velocity. The metric used to scale the disturbed fields is taken to be the weighted total energy with its zonal, meridional kinetic and available potential energy terms having equal contributions. Also this weighted total energy norm is used to monitor the growths rates of the fastest growing error modes. The method and the breeding application are still in a testing phase. However, the first bred vectors are analyzed and the most sensitive regions in the ocean responsible for inter-annual to decadal variability are localized. A refinement of the scaling procedure of the amplitude of the disturbances in between the iterative steps is suggested in the study. And finally, perturbation of the initial fields are generated to initiate reliable ensemble forecast.