Geophysical Research Abstracts
Vol. 16, EGU2014-12156, 2014
EGU General Assembly 2014

AMOC Decadal predictability using linear optimal perturbation to generate ensemble in the IPSL-CM5A-LR climate model.

Agathe Germe (1), Florian Sévellec (2), Juliette Mignot (1), Didier Swingedouw (3), Sebastien Nguyen (1), and Eric Guilyardi (1)

(1) LOCEAN/IPSL, Paris, France (agathe.germe@locean-ipsl.upmc.fr), (2) University of Southampton, Southampton, United Kingdom, (3) LSCE/IPSL, Gif sur Yvette, CEA Saclay, France

In weather and climate predictions, ensemble experiments ($i.e.$ addition of small disturbances to the initial state), measure the impact of initial conditions uncertainties. The choice of the methodology used to generate the ensemble plays a key role on the ensemble spread, hence on the predictability assessment as well as the accuracy of climate prediction. There exists several methods to generate ensemble, for example, mixing different start dates for the initial state of the atmosphere and of the ocean, applying ensemble Kalman filter-type assimilation methods, and using linear optimal perturbations. Since the last gives the upper bound of error growth in a linear framework by construction, it is directly useful to assess the lower limit of predictability. In this study we explore the impact of linear optimal perturbations (the optimality being define in regard to the intensity of the Atlantic meridional overturning circulation - AMOC) on the skill and reliability of the AMOC predictions in a perfect model configuration.

We used the linear optimal perturbation of the sea surface temperature, computed by using a linear adjoint of the ocean model NEMO (Sevellec et al., 2008). This perturbation, multiplied by a range of intensity, is applied to a control simulation of IPSL-CM5A-LR climate model at different starting dates ,to generate a set of perfect model predictions ensemble. Based on those simulations, the ensemble spread and related potential predictability of the AMOC is investigated. To evaluate the value of our ensemble set generated through the use of linear optimal perturbation, we compare it to another ensemble set generated by applying a white noise on sea surface temperature (Persechino et al., 2012).

Persechino A., J. Mignot, D. Swingedouw, S. Labetoulle, and E. Guilyardi (2012) Decadal predictability of the Atlantic meridional overturning circulation and climate in the IPSL-CM5A-LR model. Clim. Dyn., 40:2359-2380, doi: 10.1007/s00382-012-1466-1

Sévellec, F., T. Huck, M. Ben Jelloul, N. Grima, J. Vialard and A. Weaver, 2008: Optimal surface salinity perturbations of the meridional overturning and heat transport in a global ocean general circulation model, *J. Phys. Oceanogr.*, 38, 2739-2754.