Geophysical Research Abstracts
Vol. 14, EGU2012-10574, 2012
EGU General Assembly 2012

Estimation of the uncertainty of a climate model using an ensemble simulation

A. Barth (1), P. Mathiot (2), and H. Goosse (2)

(1) GHER/AGO, University of Liege, Liege, Belgium (a.barth@ulg.ac.be), (2) Earth and Life Institute, Université Catholique de Louvain, Louvain la Neuve, Belgium

The atmospheric forcings play an important role in the study of the ocean and sea-ice dynamics of the Southern Ocean. Error in the atmospheric forcings will inevitably result in uncertain model results. The sensitivity of the model results to errors in the atmospheric forcings are studied with ensemble simulations using multivariate perturbations of the atmospheric forcing fields.

The numerical ocean model used is the NEMO-LIM in a global configuration with an horizontal resolution of 2°. NCEP reanalyses are used to provide air temperature and wind data to force the ocean model over the last 50 years. A climatological mean is used to prescribe relative humidity, cloud cover and precipitation. In a first step, the model results is compared with OSTIA SST and OSI SAF sea ice concentration of the southern hemisphere. The seasonal behavior of the RMS difference and bias in SST and ice concentration is highlighted as well as the regions with relatively high RMS errors and biases such as the Antarctic Circumpolar Current and near the ice-edge.

Ensemble simulations are performed to statistically characterize the model error due to uncertainties in the atmospheric forcings. Such information is a crucial element for future data assimilation experiments. Ensemble simulations are performed with perturbed air temperature and wind forcings. A Fourier decomposition of the NCEP wind vectors and air temperature for 2007 is used to generate ensemble perturbations. The perturbations are scaled such that the resulting ensemble spread matches approximately the RMS differences between the satellite SST and sea ice concentration. The ensemble spread and covariance are analyzed for the minimum and maximum sea ice extent. It is shown that errors in the atmospheric forcings can extend to several hundred meters in depth near the Antarctic Circumpolar Current.