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Optimal adjustment of atmospheric forcing parameters for long term simulations of the global ocean circulation

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Sea surface temperature (SST) is more accurately observed from space than nearsurface atmospheric variables and air-sea fluxes. But ocean general circulation models used for operational forecasting or simulations of the recent ocean variability use, as surface boundary conditions, bulk formulae which do not directly use the observed SST. In brief, models do not use directly in their forcing one of the best observed ocean surface variable, except when explicitly assimilated.

The objective of this research is to develop a new assimilation scheme based on advanced statistical methods that will use SST satellite observations to constrain (within observation-based air-sea flux uncertainties) the surface forcing function (bulk formulae parameters and surface atmospheric input variables) of ocean circulation simulations.

The idea is to estimate a set of corrections for the atmospheric input data from ERAinterim reanalysis, that cover the period from 1989 to 2007. We use a sequential method based on the SEEK filter, with an ensemble experiment to evaluate parameters uncertainties. The control vector is extended to correct forcing parameters (air temperature, air humidity, downward longwave and shortwave radiations, precipitation, wind velocity). Over experiments of one month duration, we assimilate observed monthly SST products (Hurrel, 2008) and SSS seasonal climatology (Levitus, 1994) data, to obtain monthly parameters corrections that we can use in a free run model. This work is carried out with a global configuration of the NEMO model, at a 2° resolution.

The first results (obtained for every month of 2004) show that the estimated parameters directly used in the model has the same type of impact on the SST than the analysis itself. We can thus produce, on a global scale, and over a large time period, an optimal flux correction set that leads to a better agreement between free run model SST and observations. This method leads to results that are comparable, for the net heat flux, to empirical corrections applied in the past to produce better forcing set.