Geophysical Research Abstracts
Vol. 20, EGU2018-9421, 2018
EGU General Assembly 2018

North Atlantic ocean ensemble simulations: structure and sensitivity of ensemble statistics to the forcing method.

Thierry Penduff (1), Stéphanie Leroux (2), Jean-Marc Molines (1), and Jean-Michel Brankart (1)

(1) CNRS - IGE, MEOM, Grenoble, France (thierry.penduff@univ-grenoble-alpes.fr), (2) Ocean Next, Grenoble, France

Eddying NEMO simulations driven by a climatological forcing spontaneously generate a Chaotic Intrinsic Variability (CIV). The CIV is fed by mesoscale turbulence, and then cascades toward regional-to-basin scales and 1-100 year timescales, with strong imprints on most operationally-relevant variables, among which SLA, SST or current velocities. In the context of oceanic hindcasts or operational forecasts, this CIV is superimposed on the atmospherically-driven variability, and yields a significant uncertainty on the simulated variability, whose study thus requires ensemble simulations.

In the context of the GLO-HR CMEMS project, we performed two 20-year (1993- 2012) ensembles of North Atlantic ocean/sea-ice 1/4° hindcasts; the ensemble members were driven by the same atmospheric reanalysis, but started from slightly different initial conditions. This study describes the growth, saturation, structure and temporal variability of the ensemble spread in the basin for both ensemble simulations. These simulations differ by their forcing strategy: all members in ensemble A are forced “classically” (i.e. independently) through bulk formulae, while all members in ensemble B are forced by the ensemble-mean air-sea fluxes computed at each time step from bulk formulae. The SST ensemble spread (or CIV) is shown to be damped in ensemble A by the implicit feedback associated with turbulent air-sea fluxes, while it is not in ensemble B. In both ensembles however, the subsurface temperature spread appears to be barely sensitive to the forcing method, indicating that the source of the ensemble spread remains almost untouched by the forcing method.