Geophysical Research Abstracts
Vol. 17, EGU2015-15403, 2015
EGU General Assembly 2015

The seamod.ro operational stochastic forecasting system of the Black Sea

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Since the end of 2011, the GHER hydrodynamic model is ran daily to provide operational weekly forecasts of the Black Sea hydrodynamics, as well as the associated uncertainty. The model has ∼4km horizontal resolution, 31 vertical layers, comprises 6 rivers with climatological fluxes, and is laterally forced with NCEP GFS atmospheric fields.
The free model has been extensively validated in previous studies (Capet et al, 2012). Among others, it presents all the expected features in the Black Sea, and has also been shown to run 40 years without nudging or data assimilation while conserving total quantities and maintaining the mixed layer depth and the halocline.
The operational model has been transformed into an ensemble, by perturbing the initial conditions with the Weakly Constrained Ensembles algorithm, by perturbing the wind (and other atmospheric forcing fields) using additive noise obtained from an EOF decomposition, and by perturbing viscosity and diffusion coefficients, and river fluxes. SST images and ARGO profiles are then assimilated daily, using the Ocean Assimilation Kit. Data assimilation is tuned so that it is not too brutal, and hence error magnitudes (computed a posteriori with independent observations) increase only slightly with lead days.
The short-term ensemble forecasts are further validated (Rim Current and semi-permanent eddies, SST maps, mixed layer depth maps, cross-shelf exchanges...).
The a priori model error, estimated by the ensemble spread, is also shown to correspond well to the a posteriori model errors (the difference between ensemble mean and independent observations).
Future improvements to the forecasting system may include better atmospheric forcing fields, the inclusion of a biological/optical model (critical for SST), a nested model in the shelf area, a non-gaussian and non-intrusive data assimilation scheme, and the inclusion of different hydrodynamical models in the ensemble.