
Stochastic Coastal/Regional Uncertainty Modelling: a Copernicus marine research project in the framework of Service Evolution

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Abstract

Ocean model uncertainties arise on a range of spatiotemporal scales from the formulation of forecast models themselves and erroneous boundary conditions. The project entitled Stochastic Coastal/Regional Uncertainty Modelling (SCRUM) aims at strengthening CMEMS in the areas of ocean uncertainty quantification, ensemble consistency verification and ensemble data assimilation. The project has been initiated by the University of Athens and LEGOS/CNRS research teams, in the framework of CMEMS Service Evolution.

The work is based on stochastic modelling of ocean physics and biogeochemistry in the Bay of Biscay, on an identical sub-grid NEMO configuration of the IBI-MFC system. In a first step, we consolidate up-to-date stochastic modelling approaches, based on auto-regressive processes. In a second step, we introduce two methodologies, i.e. rank histograms and array modes, aimed at checking the consistency of the above ensembles with respect to CMEMS TAC data and arrays.

Preliminary results highlight that wind uncertainties dominate all other sources of model errors. Ecosystem model uncertainties emerging from perturbations in physics appear to be moderately larger than those perturbing the concentration of the biogeochemical compartments. First consistency results show that the model ensemble and the pseudo-ensemble of OSTIA (L4) observation SSTs appear to exhibit nonzero joint probabilities with each other since error vicinities overlap. Rank histograms show that the model ensemble is initially under-dispersive, though results improve in the context of seasonal-range ensembles.

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