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Data assimilation and data fusion in a regional simulation

N. Hoareau (1), M. Umbert (1), A. Turiel (1), J. Ballabrera (2), and M. Portabella (2)

(1) ICM/CSIC, Departament d'Oceanografia Física, Barcelona, Spain (nhoareau@icm.csic.es), (2) UTM/CSIC, Barcelona, Spain (joaquim@cmima.csic.es)

An Ensemble Kalman filter [Ballabrera-Poy et al., 2009] has been used to assimilate Sea Surface Temperature (SST) and Argo data into a regional configuration of the NEMO-OPA ocean model. Our validation of the data assimilation experiments include the comparison against a random ensemble of Argo profilers previously set aside (cross-validation), where the usual metrics are estimated from the differences of our data assimilation fields against Argo data (root mean square, mean value, standard deviation). We have also developed another metric based on the multifractal structure of the flow, comparing the histograms of singularity exponents of observations, as well as those of the background and analysis fields. While the first approach does directly measure the point by point difference between the model data and the in-situ independent observation, the second method focuses on the geophysical coherence of dynamical structures as it gives information about multi-point spatial correlations.
In a second part of this work we have analysed the relative advantages and drawbacks between data assimilation (here based on the Ensemble Kalman filter) and data fusion (here based on the Multifractal Microcanonical Formalism, see Pottier et al., 2008) when applied to the production of quality remote sensing products of ocean observation. We have thus used both methods for the generation of SMOS Level 4 products of Sea Surface Salinity; the resulting maps have been validated with our metrics and analyzed at global and regional basis.