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Coastal Rapid Environmental Assessment in the Northern Adriatic Sea

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A high-resolution, coastal ocean model has been developed in the Northern Adriatic with the goal of establishing a Rapid Environmental Assessment strategy which consists of coastal monitoring networks and a large scale operational ocean model. The Adriatic Shelf (ASHELF) model, based on POM code, has been implemented with O(800 m) horizontal resolution and 31 vertical sigma layers. The ASHELF model is one-way nested to the Adriatic Forecasting System (AFS) model which provides initial and boundary conditions data.
The observing and modeling system has been used both to initialize the high resolution ASHELF model and to assimilate the observed data. The assimilation technique consists of a correction of the initial field, provided by the AFS, on the basis of the available observations. The blending of the two data sets has been carried out through a multi-scale optimal interpolation technique applied to blend coastal data with large-scale model fields for initialization.
The spin up time has been investigated by two dedicated experiments in order to be able to reach the maximum accuracy in model forecast in a minimum time. ASHELF model has been initialized from AFS downscaling interpolation technique using 21 successive days and runs till a target day. Evaluation of the model energetics and comparisons with observations show that for the Northern Adriatic and for the forcing considered, a spin-up period of one week allows the total kinetic energy to reach equilibrium with the higher resolution nested model simulation results.
The two time periods considered in our experiments are April and August 2003 when a large amount of coastal observations were collected weekly in the framework of ADRICOSM Project, permitting us to test model performance in this very critical area characterized by a shallow and wide continental shelf and substantial freshwater inflow from rivers.
The improvement deriving from the blending of coarse resolution AFS temperature and salinity fields with in-situ observations has been evaluated by mean of standard statistics (bias, root mean square error and pattern correlation coefficient) between model results and in-situ (coastal CTDs) and remote sensing observations (Satellite Sea Surface Temperature). Space and time mean of all the considered statistics shows that forecast skills improves with the assimilation.