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Marine Rapid Environmental Assessment using relocatable nesting in multiscale operational analyses

Nicoletta Fabbroni (1), Nadia Pinardi (1), Paolo Oddo (2), Pierre Lermusiaux (3), Maurizio De Marte (4), and Pierre-Marie Poulain (5)

(1) University of Bologna, Ravenna, Italy (n.fabbroni@sincem.unibo.it), (2) National Group of operational oceanography, INGV, Bologna, Italy, (3) Massachusetts Institute of Technology, MIT, Cambridge, USA, (4) Istituto Idrografico della Marina, Genova, Italy, (5) OGS, Trieste, Italy

A Marine Rapid Environmental Assessment (MREA) experiment has been carried out in the Ligurian Sea (North-Western Mediterranean Sea) in May-June 2007. The MREA experiment aimed at the definition of the scientific basis for rapid deployment of relocatable nested high resolution models to increase the short term (few days) predictability of particle trajectories. The observational part of the experiment consisted mainly in the collection of temperature and salinity data from CTD and the launch of surface drifters.
The modelling part of the experiment consisted of a hierarchy of numerical models: (1) the operational coarse resolution ocean model from the Mediterranean Forecasting System (MFS) that provides ocean forecast for the whole Mediterranean Sea at a horizontal resolution of approximately 6.5 km; (2) a relocatable Ligurian Intermediate Model (LIM) with 3 km horizontal resolution for the whole Ligurian Sea: (3) a finer relocatable model, Ligurian High Resolution Model (LHRM), for the central Ligurian Sea with a horizontal resolution of approximately 1 km. The relocatable models are based on the Harvard Ocean Prediction System (HOPS) and they are all one-way nested. All the modelling systems (MFS, LIM and LHRM) interactively compute heat and momentum surface fluxes using the European Centre for Medium Range Weather Forecast (ECMWF) operational products. The numerical hindcasting is done for approximately 10 days, starting few days before the hindcast nominal days and continuing for one week after.
The quality of the double nesting system has been evaluated by means of comparisons with the in-situ salinity and temperature data and the lagrangian drifter buoys trajectories. The nested relocatable system is better than MFS, i.e., the higher resolution models are capable to improve the water mass characteristics on a weekly time scale. The velocity fields simulated by MFS and the relocatable models are input to the deterministic part of a trajectory model. Comparison between simulated and observed drifter trajectories show a significant improvement deriving from the usage of the high resolution eulerian fields nested in the operational analysis fields.