Geophysical Research Abstracts
Vol. 16, EGU2014-16839-1, 2014
EGU General Assembly 2014

Towards a coastal ocean forecasting system in Southern Adriatic Northern Ionian seas based on unstructured-grid model

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The Southern Adriatic Northern Ionian Forecasting System (SANIFS) operational chain is based on a nesting approach. The large scale model for the entire Mediterranean basin (MFS, Mediterranean Forecasting system, operated by INGV, e.g. Tonani et al. 2008, Oddo et al. 2009) provides lateral open boundary conditions to the regional model for Adriatic and Ionian seas (AIFS, Adriatic Ionian Forecasting System) which provides the open-sea fields (initial conditions and lateral open boundary conditions) to SANIFS. The latter, here presented, is a coastal ocean model based on SHYFEM (Shallow HYdrodynamics Finite Element Model) code, which is an unstructured grid, finite element three-dimensional hydrodynamic model (e.g. Umgiesser et al., 2004, Ferrarin et al., 2013).

The SANIFS hydrodynamic model component has been designed to provide accurate information of hydrodynamics and active tracer fields in the coastal waters of Southern Eastern Italy (Apulia, Basilicata and Calabria regions), where the model is characterized by a resolution of about of 200-500 m. The horizontal resolution is also accurate in open-sea areas, where the elements size is approximately 3 km.

During the development phase the model has been initialized and forced at the lateral open boundaries through a full nesting strategy directly with the MFS fields. The heat fluxes has been computed by bulk formulae using as input data the operational analyses of European Centre for Medium-Range Weather Forecasts.

Short range pre-operational forecast tests have been performed in different seasons to evaluate the robustness of the implemented model in different oceanographic conditions. Model results are validated by means of comparison with MFS operational results and observations. The model is able to reproduce the large-scale oceanographic structures of the area (keeping similar structures of MFS in open sea), while in the coastal area significant improvements in terms of reproduced structures and dynamics are evident.