OPERATIONAL OCEAN FORECASTING IN THE ADRIATIC SEA: RECENT IMPROVEMENTS

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Abstract
The Ocean Forecasting System for the Adriatic Sea implemented within the framework of the ADRICOSM Project has recently been upgraded in terms of resolution (both vertical and horizontal), parameterizations, and numerical schemes. The results of these improvements are shown.
Keywords : Adriatic Sea, Circulation Models, Water Transport.

Within the ADRICOSM (ADRIatic sea integrated COastal areaS and river basin Management system) partnership (http://www.bo.ingv.it/adricosm-partnership/), near real time monitoring and basin-shelf marine forecasting systems have been implemented, and are now being used in operational mode for the Adriatic Sea. The numerical forecasting model used (AREG, Adriatic REGional model) is based on the Princeton Ocean Model [1]. Its implementation covers the entire Adriatic Sea and extends into the Ionian Sea.

Every week the operational system produces 7 days of hindcast (from noon of the previous Tuesday up to noon of the current week Tuesday) and 9 days of forecast. The hindcast is forced at the surface by the European Centre for Medium Range Weather Forecast (ECMWF) atmospheric analyses; it uses the Mediterranean Forecasting System (MFS) [2] analyses as lateral open boundary conditions, and the observed daily Po run-off. For the forecast the model is forced using ECMWF and MFS operational forecast, while the last available Po values are persisted.

The operational runs take place every Wednesday morning and the results of the forecast and hindcast are available on a dedicated ftp server, both for research and commercial users. Furthermore, many images of all the calculated fields are visible on the web (http://www.bo.ingv.it/adricosm).

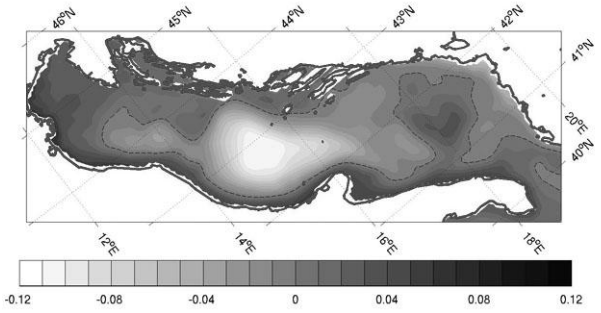

Fig. 1. Predicted Sea Surface Elevation anomalies (m) for 10 October 2006 by the previous operational system.

The AREG model has recently been improved in terms of resolution, parameterizations, and numerical schemes. A detailed description of the model implementation can be found in Oddo et al., 2005 [3]. The resolution has been upgraded both horizontally and vertically. Horizontally it changed from approximately 5 km to 2.2 km (the grid is regular in both cases), while vertically it changed from 21 to 31-sigma levels.

The surface boundary condition for the vertical velocity has been changed from the old standard POM kinematic condition [3] to the new dynamic condition taking into account the water balance as follows:

$$w\mid_{z=\eta} = \left(\frac{\partial \eta}{\partial t} + \bar{v}\cdot\nabla\eta\right)\Big|_{z=\eta} = (E - P - R) \qquad (1)$$

where η is the surface elevation; E, P, and R are evaporation, precipitation and river runoff; w is the vertical velocity; and v is the horizontal velocity field. In the new implementation a flux limiting advection scheme [4] has been implemented allowing a better reproduction of the horizontal and vertical gradients. This change has the effect to mitigate some previous model deficiencies related to the overestimation of numerical diffusion [3]. After these major changes most of the model deficiencies [3] seem to be fixed. In figs.1 and 2 the sea surface elevation anomalies for 10th October 2006 predicted by the model are shown The new solution (fig.2) indicates the model capability to reproduce smaller scales features and to better represent the dynamics in the Southern part of the basin.

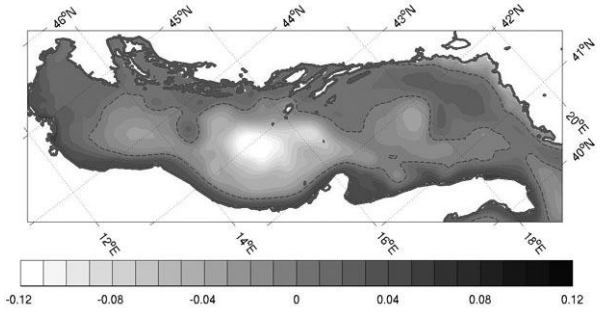

Fig. 2. Predicted Sea Surface Elevation anomalies (m) for 10 October 2006 by the improved operational system.

References

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