An Operational MET-OCEAN Regional Forecast System in the Galician Coast

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ABSTRACT

MeteoGalicia (the regional meteorological agency) inside ESEOO project has been developing a regional oceanographic forecast system in the Galician Coast (NW-Spain) to provide forecasts on currents, water temperature, salinity and sea level. This system is based on MOHID hydrodynamic model forced with the operational meteorological model MM5 supported daily at MeteoGalicia. A grid mesh of ~1.8 Km at the shelf scale and ~500 m at the Ría scale is used. Model salinity and temperature fields along the open boundary are relaxed at all depth to the regional model data (~ 5 Km) run daily at Puertos del Estado (PE). Temperature and Salinity initial fields are also obtained from this regional application. The operational scheme is run daily. Currents are compared against Seawatch buoys data provided by Puertos del Estado and against drifting ARGOS buoys used during an oil spill emergency simulation in the Galician Coast.

KEY WORDS: Operational Oceanography; Hydrodynamic numerical modeling; Galician Coast.

INTRODUCTION

Nowadays accurate operational modeling of global oceans is becoming a reality due to the implementation of new observing techniques and the improvement of numerical models and data assimilation techniques. The ESEOO project has had as one of its main objectives the development and implementation of a Spanish Operational Oceanography system able to be used in emergency situations at sea, such as oil spill accidents or tracking of drifting objects. In order to fulfill this objective a downscaling approach (from global to coastal) has been taken into account to design the numerical model applications. MeteoGalicia has developed a high resolution application for the Galicia coastal areas inside the local scale approach of the ESEOO project. This local application cover the whole Galicia coastline and is set up by both permanent operational domains nested on the regional scale model run by PE and relocatable domains used in case of emergency. This application provide forecast of several Physical parameters, such as winds, currents, sea surface temperature, waves and sea level.

The ocean is an extreme variable system both in space and time. Its variability is partly induced by different forcing such as the meteorological one (wind and mean sea level conditions), the astronomical one (tides), and changes in temperature and salinity. Additionally, the ocean dynamic is heavily influenced by the turbulence that favors the interaction between processes of different scales. All these factors, besides detailed information of the bathymetric depths of the study domain, should be taken into account to produce an accurate ocean forecast system.

MODEL DESCRIPTION

The MOHID model has been originally developed by the MARETEC Group of the Instituto Superior Técnico (Technical University of Lisbon, Portugal). This model has shown its ability to simulate complex coastal and estuarine flows (Coelho et al., 2002), not only in barotropic way, as in baroclinic.

The MOHID system uses a finite volume approach (Chippada et al. 1998; Martins et al 2001) to discretize the equations. In this approach, the discrete form of the governing equations is applied macroscopically to a cell control volume. This makes the actual way of solving the equations independent of cell geometry and permits the use of a generic vertical coordinate that allows minimizing the errors of some of the classical vertical coordinates (Martins et al. 2001). The equations are discretized horizontally in an Arakawa-C’ manner staggered grid. The temporal discretization is carried out by means of a semi-implicit (ADI) algorithm with two time levels per iteration.