The ESEOO Regional Ocean Forecasting System

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ABSTRACT

The ESEOO Project has as main objective the development and implementation of a Spanish Operational Oceanography System able to be used in emergency situations at sea such as oil spill accidents. Within this project, an important effort is being carried out in order to establish forecast systems, based on numerical modelling, to provide predictions of oceanographic variables, such as currents, which are determinant in the tracking and forecasting of spillage trajectories. To this aim, three different domains, named ESEOAT, ESEOMED and ESEOCAN that cover together completely the Spanish waters have been selected to run different regional applications, based on ocean circulation models. The POLCOMS model is used to run the two Atlantic domains, whereas the DIECAST model is used in the Mediterranean run. The regional ESEOO ocean forecast system provides daily ocean forecasts for a 72h horizon. Examples of both available ESEOO forecast products and model validation performed are shown in this paper.

KEY WORDS: ESEOO; operational ocean forecast; numerical modeling; surface currents; Northeastern Atlantic; western Mediterranean; Canary Islands.

INTRODUCTION

The “Prestige” wreck and the ensuing major oil spill crisis highlighted the limitations of the Spanish operational oceanography capability to respond effectively to a crisis of this nature. Despite the efforts of several groups and institutions to forecast the drift and spread of the oil spill during and after the immediate crisis (Montero et al 2003, Daniel et al 2004 and Hackett, 2004), the event illustrated the need to improve the operational oceanography infrastructure in Spain. Particular shortcomings were identified, being the lack of operational systems able to forecast currents and transports the most pressing one.

In response, the ESEOO (Establecimiento de un Sistema Español de Oceanografía Operacional) Project was established and funded by the Spanish Ministry of Science. The main objective of the ESEOO Project was to promote operational oceanography in Spain (Álvarez Fanjul et al., 2007). Within the project, regional ocean circulation forecast systems based on numerical modelling have been developed in order to provide predictions of a range of oceanographic variables within Spanish waters.

Nowadays accurate operational modelling of global oceans is becoming a reality due to the implementation of new observing techniques and the improvement of numerical models and assimilation techniques. The ESEOO project has as one of its maximum priorities obtaining reliable outputs for coastal areas. In order to fulfill this objective a downscaling approach (from global to coastal) has been taken into account to design the numerical model applications. This downscaling approach is necessary for several reasons: inclusion of additional physic phenomena (e.g. tidal forcing, fresh water inputs), higher spatial resolution as well as higher frequency updating the atmospheric forcing in the forecast, etc. Following these ideas, numerical modelling in ESEOO has been separated into three different levels: global, regional and coastal. Spatial resolution of ocean models span from few kilometres (global and regional) to hundreds of meters (coastal). Following this downscaling approach and taking initial and boundary conditions from global ocean models provided by global systems such as FOAM, MERCATOR, NCOM and MFSTEP, three different domains that cover together completely the Spanish waters have been selected to run different regional applications.

DESCRIPTION OF THE ESEOO FORCAST SYSTEM

The ESEOO forecast system consist of a set of different applications, which objective is to produce a daily short-term (72 hours) forecast of currents and other oceanographic variables, temperature and salinity among others, as well as to obtain a better understanding of the ocean dynamic. The Forecast System is based on the use of numerical circulation models driven by meteorological and oceanographic forcing.

In order to fulfill the objective of providing ocean forecast over the Spanish waters, the ESEOO system is constituted by thee different regional applications, named ESEOAT, ESEOMED and ESEOCAN, respectively focused on providing coverage over the Iberian