Geophysical Research Abstracts
Vol. 18, EGU2016-17275, 2016
EGU General Assembly 2016

Mediterranea Forecasting System: a focus on wave-current coupling

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The Mediterranean Forecasting System (MFS) is a numerical ocean prediction system that produces analyses, reanalyses and short term forecasts for the entire Mediterranean Sea and its Atlantic Ocean adjacent areas. MFS became operational in the late 90's and has been developed and continuously improved in the framework of a series of EU and National funded programs and is now part of the Copernicus Marine Service.
The MFS is composed by the hydrodynamic model NEMO (Nucleus for European Modelling of the Ocean) 2-way coupled with the third generation wave model WW3 (WaveWatchIII) implemented in the Mediterranean Sea with 1/16 horizontal resolution and forced by ECMWF atmospheric fields. The model solutions are corrected by the data assimilation system (3D variational scheme adapted to the oceanic assimilation problem) with a daily assimilation cycle, using a background error correlation matrix varying seasonally and in different sub-regions of the Mediterranean Sea.
The focus of this work is to present the latest modelling system upgrades and the related achieved improvements.
In order to evaluate the performance of the coupled system a set of experiments has been built by coupling the wave and circulation models that hourly exchange the following fields: the sea surface currents and air-sea temperature difference are transferred from NEMO model to WW3 model modifying respectively the mean momentum transfer of waves and the wind speed stability parameter; while the neutral drag coefficient computed by WW3 model is passed to NEMO that computes the turbulent component. In order to validate the modelling system, numerical results have been compared with in-situ and remote sensing data.
This work suggests that a coupled model might be capable of a better description of wave-current interactions, in particular feedback from the ocean to the waves might assess an improvement on the prediction capability of wave characteristics, while suggests to proceed toward a fully coupled modelling system in order to achieve stronger enhancements of the hydrodynamic fields.