

# The GNOO-INGV Mediterranean ocean Forecasting System and Adriatic sea Forecasting System

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## Abstract

The Mediterranean Forecasting System (MFS) is operationally working since the year 2000 and it is continuously improved in the frame of international projects. The system is part of the Mediterranean Operational Oceanography Network – MOON - and is coordinated and operated by the Italian Group of Operational Oceanography (GNOO) at the National Institute of Geophysics and Vulcanology (INGV).

The latest upgrades and integrations to MFS has been undertaken in the EU-MERSEA, BOSS4GMES and MyOcean Projects. Since October 2005 a 10-day forecast is produced daily, and a 15-day analyses once a week. The daily forecast and weekly analysis data are available in real time to the users through a dedicated ftp service and every day a web bulletin is published on the web site (<http://gnoo.bo.ingv.it/mfs>). Fig. 1 shows the salinity field at 30m for the forecast of the 28 March 2009. A continuous evaluation of the forecasts and analyses produced by MFS in near real time has been developed in order

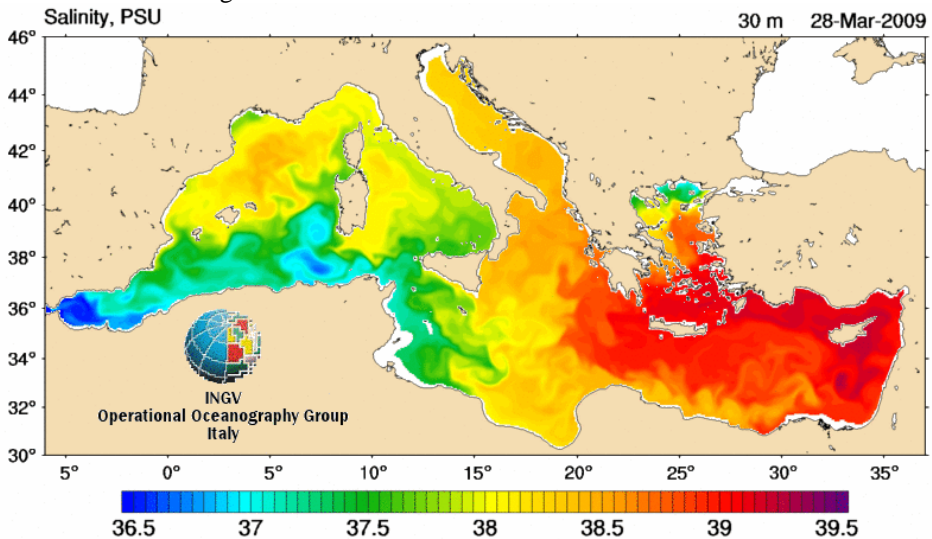
to constantly verify the system and to provide some useful information to the users. The MFS forecast system production is done using an OGCM implemented on the Mediterranean Sea and an assimilation scheme able to assimilate all the available in situ and satellite data. At present two different systems, SYS3a2 and SYS4 are running in parallel every day. SYS3a2 is the official one while SYS4 is under evaluation. SYS3a2 is composed by the numerical code of OPA8.2 implemented on the Mediterranean sea (Tonani et al., 2008) and 3DVAR assimilation scheme (Dobricic et al. 2008). SYS4 uses NEMO as numerical model and 3DVAR as well for the assimilation. The major difference between the two systems is that the boundaries in the Atlantic ocean are closed for SYS3a2, they're open for SYS4, which is nested into GLOBAL – MERCATOR .

The Adriatic Forecasting System (AFS) is nested into the Mediterranean Forecasting System - MFS (Pinardi et al, 2003; Tonani et al., 2008), and as well is managed in Bologna by the Operational Oceanography Group. AFS has been implemented within the

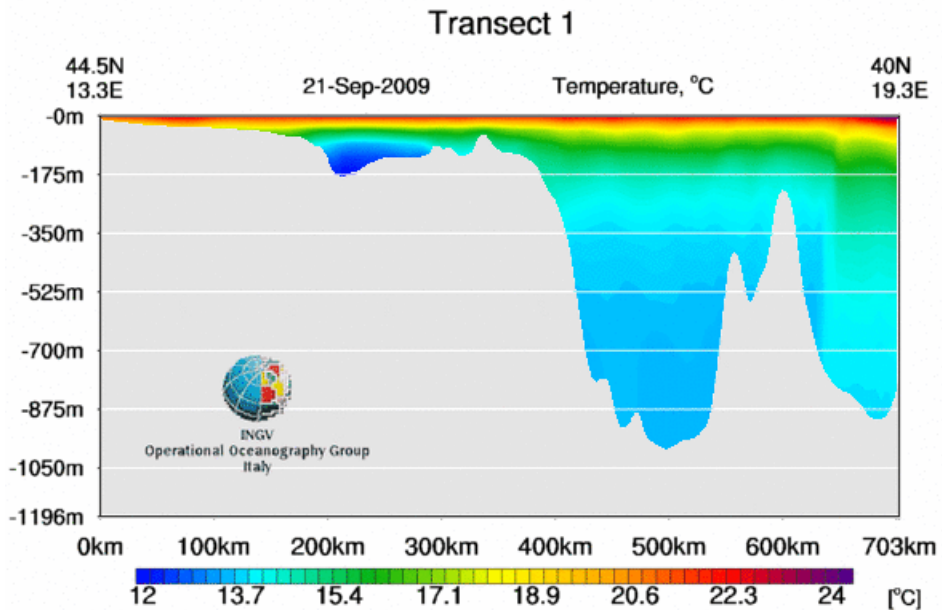
framework of the ADRICOSM Partnership (ADRIatic sea integrated Coastal areas and river basin Management system). This system provides the forecast of the main physical fields of the sea, such as temperature, salinity, currents, air-sea fluxes, sea surface elevation, and disseminates the data for reaserch and commercial purposes via ftp and via web, and publishes a daily bulletin on the web (<http://gnoo.bo.ingv.it/afs/>) in image format.

The numerical forecasting model used (AREG, Adriatic REGIONal model) is based on the Princeton Ocean Model. Its implementation covers the entire Adriatic Sea and extends into the Ionian Sea and a detailed description of the model implementation is described in Oddo et al., 2005. Tides have been introduced in the model in December 2008 through the lateral open boundary, where the Adriatic Forecasting System nests into the Mediterranean Forecasting System - at 39° North - following the formulation

of Flather (1976) on the barotropic velocities, being the tidal velocity and elevation obtained from the OTIS tidal software (Egbert and Erofeeva, 2002). The open boundary conditions are taken from the daily simulations and forecasts of the Mediterranean Forecasting System, while the atmospheric forcings come from the ECMWF data at 0.25° degrees of resolution, with a frequency of 6 hours, provided to INGV by the italian Air Force. The precipitations used in both forecasts and simulations come from the climatological dataset by Legates and Willmott (1990), while all the rivers' flows, except for the Po river, come from the climatological dataset by Raicich (1994), to which some corrections have been applied, especially along the eastern coast. For what concerns the Po River, daily means at the section of Pontelagoscuro are considered for the simulations, while the last available flow value is persisted for all the daily forecasts.



**Figure 1: Forecasted Salinity field for the 28-Mar-2009 at 30m of depth.**



**Figure 2** Forecasted temperature for the 21-Sep-09 along a transect crossing the Adriatic sea from north to south.

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