REAL TIME REGIONAL FORECASTING SYSTEM INTO THE SICILY CHANNEL

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Abstract
Real time short-term forecasts of the circulation in the Sicily Channel are operationally produced and their accuracy against satellite sea surface temperature fields is evaluated from August 20th to October 20th 2009 on a daily basis. This analysis allowed us to assess the skill of the present ocean forecasting system.
Keywords: Models, Circulation, Straits And Channels, Sicilian Channel

The Forecasting System
The Sicilian Channel Regional Model Forecasting System (SCRMFS) is based on a nested eddy resolving numerical model implemented in the Sicily Channel area. It is driven at the surface by the hourly forcing from the Limited Area Model ETA/SKIRON atmospheric forecast fields with a horizontal resolution of 10 km [1]. The atmospheric forcing parameters include: mean sea level pressure, air temperature at 2 m, wind speed and direction at 10 m, convective and accumulated precipitation and cloud cover. The net short-wave radiation flux and the downward long-wave radiation flux at the sea surface are provided directly by the weather prediction model at 1-hour interval, while latent and sensible heat fluxes are given by the bulk aerodynamic formulae. Surface momentum fluxes are calculated using the computed drag coefficient of Hellerman and Rosenstein [2]. At the open boundaries, the SCRMFS is nested with the coarse model MFS1671 [3] through an off-line one way nesting technique of the forecasted daily mean fields of temperature, salinity and total velocity. This method was found to be computationally efficient and sufficiently robust to transmit information across the lateral boundaries without excessive distortion [4]. The SCRMFS is initialized daily in slave mode, then through the downscaling and optimization of coarse resolution forecast fields (temperature, salinity and current velocity) using the Variational Initialization method, named VIFOP [5]. It allows to reduce the high frequency oscillations during the initial conditions (spin-up time) [6]. SCRMFS produces daily 5-day forecast, in slave mode, providing detailed information on the mesoscale and sub-mesoscale components that cannot be resolved by the coarse resolution model. The performance of SCRMFS depends on the accuracy of the hourly surface wind stress and heat fluxes provided by SKIRON, but in a slave mode forecast the quality of the initial conditions derived from the downscaling of the first forecasted day of the coarse resolution model is even more critical.

The validation
The dataset used for the online validation is the daily NRT Optimally Interpolated Sea Surface Temperature (OISST), obtained from the AVHRR (Advanced Very High Resolution Radiometer) night-time data acquired and processed at ISAC-GOS of CNR. The level of agreement between the forecast and the truth (assumed to be given by the satellite observation) is computed using basic statistics, such as the correspondence between the mean forecast and mean observation (BIAS), the root mean square error (RMSE), the standard deviation (σ) and the Sea Surface Temperature Skill Score (SSTSS).

Results
The daily averaged scores have been computed for each forecast cycle over the period 20 August – 20 October 2009, in agreement with the largest horizontal temperature gradients due to the warm waters over shelf areas and the well-known upwelling along the south of Sicily, induced by the Atlantic Ionian Stream and its summer features. Between the fifth and last forecast cycle (Fig.1, top), the RMSE estimates a range approximately from 0.9°C to 0.6°C, while the standard deviation presents higher values. Then the SSTSS increases from 0 °C to 0.4 °C (Fig. 1, bottom). This means that the last forecast cycle (24 hours before) is about 40% better than the fifth (120 hours before). The averaged biases for the five cycles range from 0.16 °C of the first cycle to -0.05 °C of the fifth, with a clear negative trend. So the model is on average warmer the first 3 and colder the last 2 forecast days than the observations

Conclusions
The performance of SCRMFS against satellite SST has been evaluated by means of standard statistics. Notwithstanding the use of only satellite observations for a short period in time, this preliminary assessment of the forecasting system shows a reasonable performance in comparison to other forecast numerical models available from the bibliography [7] which, in slave mode, are greatly dependent on the accuracy of the coarse resolution model furnishing the initial conditions.

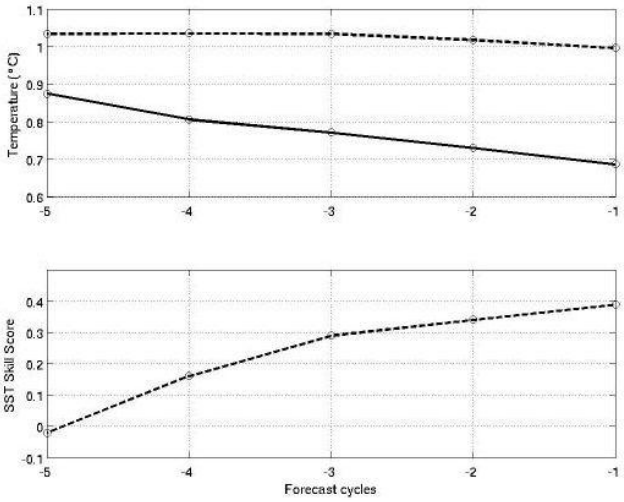

Fig. 1. Top: Standard deviation (dashed line) of the model SST field and RMSE (continuous line) between model and satellite SST, averaged for each forecast cycle; Bottom: Skill Score averaged for each forecast cycle.

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