SURFACE CIRCULATION OF THE EASTERN MEDITERRANEAN BETWEEN NOVEMBER 2005 AND OCTOBER 2007 INFERRED FROM IN-SITU DRIFTER TRAJECTORIES, MODEL AND ALTIMETRY DATA.

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Abstract

We study the surface circulation of the Eastern Mediterranean basin over 2005-2007 by comparing drifter trajectories, models and altimetry. Using pseudo-Eulerian statistics, we investigate a way to validate the model or altimetry circulation schemes with drifter data measurements.

Keywords: Eastern Mediterranean, Circulation, Models

The surface circulation in the eastern Mediterranean Sea is investigated by means of surface tracked drifters, numerical models and altimetry data for the period spanning from November 2005 to October 2007.

Within the framework of the EGYPT/EGITTO program, a total of 97 drifters drogued at 15-m nominal depth were released between September 2005 and March 2007 in the Sicily Channel and the Ionian basin [1]. All drifters were tracked with the Argos Data Location and Collection System (CLS). Drifter positions have accuracy better than 1000m. After editing, the drifter position time series were linearly interpolated every 2 hours using the kriging technique, and were then low-pass filtered and subsampled every 6 hours. The velocities were computed by finite-centered differences [2]. It is important to note that, despite the hundredth of drifters and the 18 months duration, the resulting mean pattern remains highly constrained by the spatio-temporal distribution of the drifters, up to rendering artifacts due to mesoscale eddies [1].

The numerical simulations were carried out using the Mediterranean model MED16 [3, 4] and the extracted Mediterranean domain from the operational PSY2v2 forecasting system [5], regional configurations of the primitive-equation model Ocean Parallel [6]. The horizontal resolution of both models is 1/16°(5-7km) and there are 43 vertical levels. The models were forced by daily air-sea flux and wind fields from the analyses of the European Centre of Medium-range Weather Forecast (ECMWF).

The altimetric data available for this study from CLS are the geostrophic velocities deduced from Sea Level Anomaly maps. Data are interpolated over a regular 1/8°x1/8° grid, every 7 days [7].

Both modeled and altimetric data are low-pass filtered and interpolated in space and time at the drifter positions following the method of [2]. On a grid with 0.25°x0.25° mesh, pseudo-Eulerian statistics are computed (mean current, variance ellipses, mean and eddy kinetic energies).

For example, mean flow and kinetic energy are shown for in situ observations and MED16 (Fig 1). On one hand, some of the main features of the mean flow agree, for both model and drifters : i) the main flow of Atlantic Waters (AW) bifurcates, upon exiting the Sicily Channel, into a northern branch and a southeastward one; ii) the southeastward branch reaches Libya West of 20°E and iii) from ~24°E , the eastward coastal current along Africa associated with mesoscale eddies in agreement with [8], continues northward along the Middle-East slope.

On the other hand, model and drifters mean kinetic energies mostly disagree in several areas. For example, offshore between 24°E-31°E, both mean flows show complex patterns, mostly opposite between 24 and 27°E, even displaying a partial eastward flow. This is related to a strong signature of mesoscale patterns (mostly eddies like Ierapetra or Lybian eddies at this place) in the in situ data. Actually, a good agreement between these datasets requires an exact spatio-temporal correlation between the positions of the observed and modelled eddies.

In a next step, using the whole spatio-temporal sampling of the models, we will check whether this scheme is still relevant for validating the models.

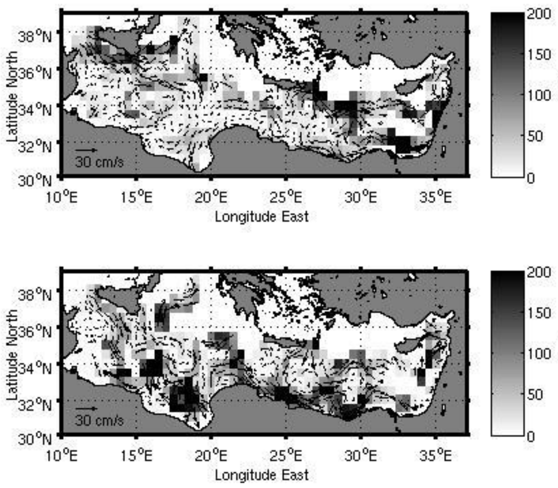

Fig. 1. Mean flow superimposed on Mean Kinetic Energy using kriged drifters data (top) and MED16 model (bottom)

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