A STUDY OF WATER CIRCULATION ALONG THE EGYPTIAN MEDITERRANEAN COAST USING A THREE DIMENSIONAL NUMERICAL MODEL

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The Egyptian Mediterranean coast lies between longitudes 25°30'E and 34°E and extends northward to latitude of 33°N. Its water volume is 224 801,54 km^3 and it has a surface area about 154 840 km^2. Striking feature of this area are the presence of different water masses which converage and mix. The Princeton Ocean Model (POM) which makes use of a curvilinear orthogonal grid and of a sigma-coordinate system was used to study the general circulation of the Egyptian Mediterranean waters. The model was described in detail by BLUMBERG and MELLOR (1987).

The model bathymetry was obtained from the bilinear interpolation of the depth data into the model grid. The model grid contains 35 x 11 points with a resolution ranges from 22 to 27 km (fig. 1). The model has three open boundaries to the West, East and North.

The model has been initialized with the temperature and salinity seasonal averages prepared by the National Institute of Oceanography and Fisheries (NIOF) at the following 22 depth layers : 0, 10, 20, 30, 50, 75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 800, 1000, 1200, 1500, 2000, 2500 and 3000 m depth. The average values of temperature and salinity were mapped on a 1/2° x 1/2°. The monthly heat flux were computed on a 1/2° x 1/2° grid.

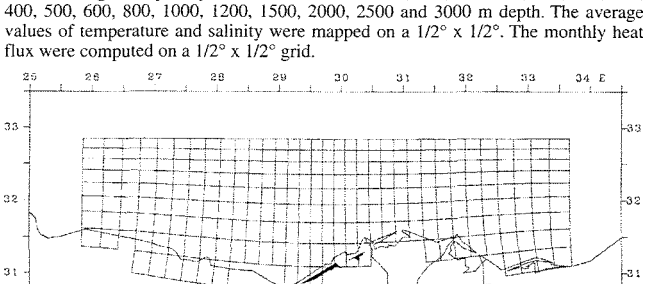

Fig. 1. The model grid.

Three numerical experiments are suggested to be performed using different kinds of surface forcings. In experiment-1, we examine the effects of seasonal water temperature and salinity fields only, by eliminating any seasonality in the surface heat and salinity fluxes and the wind stress forcing. The surface current velocity fields for the winter and summer seasons are shown in figure 2 and 3, respectively.

The surface circulation of the Egyptian waters is dominated by the easterly low along the coast and by the Mersa Matruh anticyclonic circulation in the western part of the area. In the present work, Mersa Matruh gyre exhibits a strong winter to summer variability reversing from anticyclonic to cyclonic.

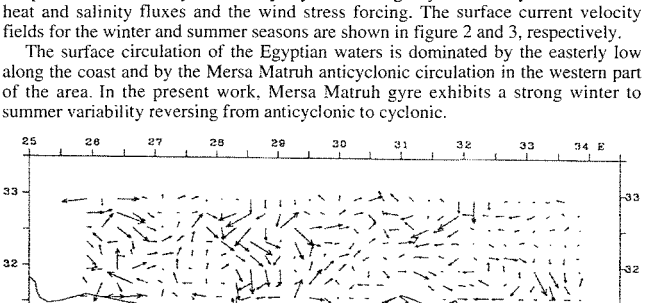

Fig. 2. Experiment-1 : Current velocity at the surface during the winter

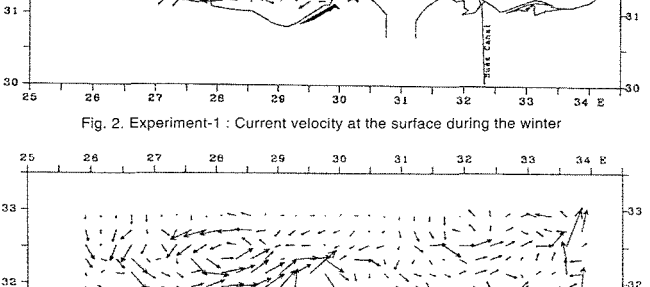

Figure 3. Experiment-1 :Current velocity at the surface during the summer

REFERENCES

BLUMBERG A. F., MELLOR G. L., 1987. A descritpion of three-dimensional coastal ocean circulation model. N. S. Heaps ed. AGU. Washington D.C. *Coastal Estuarine Sci.*, 4 : 1-16.