CHLOROPHYLL DYNAMICS OF THE NORTHERN ADRIATIC STUDIED FROM SATELLITE DATA

Mira MOROVIC

Institute of Oceanography and Fisheries, 58000 Split, P.O.Box 500, Croatia

Satellite chlorophyll dynamics from the Northern Adriatic was studied from around 30 satellite images. Studied region is presented in the figure 1. Satellite chlorophyll data from this paper were CZCS data, processed by JRC-ESA software for the chlorophyll within the frame of the OCEAN project. Temporal and spatial distribution and changes of satellite chlorophyll data were analyzed together with the Po river discharge and other parameters in order to find relationships of the physical environment to the sea water chlorophyll and determine the most powerful driving forces of chlorophyll dynamics.

Fig.1. Studied region.

Analysis was performed for chlorophyll means from areas from different spatial scales from the Northern Adriatic EOF analysis (PREISENDORFER, 1988) was also done to study different aspects of variability in terms of eigen motions and amplitudes. In most of the cases only first two modes were significant (MOROVIC *et al.*). First mode (the greatest variability of the process) was found to be correlated with the global radiation (fig.2).

Second mode was probably correlated with the Po river discharge. Some differences were found between different regions of the Northern Adriatic. Varying the size of averaged area (scaling), it was possible to find the range of influence of different parameters and differences in variability on different scales.

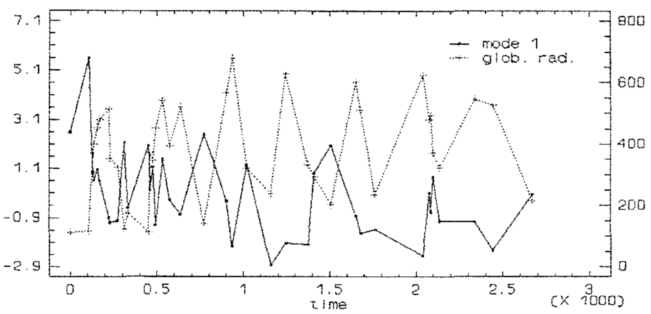

Fig.2.First mode amplitudes and global radiation

REFERENCES.

PREISENDORFER R., W., 1988. Principal component analysis in meteorology and oceanography. Elsevier. Amsterdam. 425p.

MOROVIC M., B. GRBEC and V. DADIC. Significant variabilities of the physical processes in oceanography (in preparation).

O

A NUMERICAL STUDY OF THE AEGEAN SEA GENERAL CIRCULATION

K. NITTIS, A. LASCARATOS and L. PERIVOLIOTIS

University of Athens, Department of Applied Physics, Laboratory of Meteorology and Oceanography, Athens, Greece

The general circulation of the Aegean Sea, its response to different forcing factors and its seasonal variability are studied in a series of model experiments. We use the Princeton Ocean Model (POM), designed by BLUMBERG & MELLOR (1987). In our implementation of the model we use a 50 x 50 curvilinear grid with varying grid size (5 km in North Aegean to 28 km south of Crete) and 16 levels of vertical resolution. The combined NODC–BNDO data set is used to initialize the model runs. The data are mapped onto the model grid using objective analysis techniques and their annual mean were used as initial conditions. For the open boundaries, seasonal T and S profiles were computed for the same data set at each grid point. Wind stress, heat and fresh water fluxes are interactively computed from the model's SST and climatological atmospheric parameters (wind speed, air temperature and relative humidity) taken from the NMC (CASTELLARI *et al.*, 1990). The precipitation data used were provided by D. LEGATES & C. WILLMOTT (1990). The inflow of the Black Sea waters in the Aegean through the Dardanelles straits was simulated as a source of low salinity water (S=28 psu) with constant flux throughout the year (10000 m^3/sec).

The results indicate that the wind stress is the main driving mechanism in the area but the introduction of thermal and fresh water surface fluxes enhanced the seasonal variability of the features. Under this combined forcing, the model successfully simulated the general circulation of the area and the formation of the main Aegean water masses. The winter circulation pattern proposed by OVCHINNIKOV (1966) for the whole area, seemed to be in good agreement with the model results. In Cretan Sea a large cyclonic gyre exists, while in the North Aegean a multi–system cyclonic pattern is observed. The surface water masses enter the Aegean from the Rhodes straits and contribute to the cyclonic circulation in the two parts of the basin. The summer surface circulation appears to be mainly anticyclonic. This reversal of the flow in the Cretan sea, between winter and summer, was one of the major findings of the POEM cruises in the area. A strong inflow is observed now in the western straits of the Cretan arc and the water masses move along the west coasts of Greece toward the central and northern Aegean. In Hios basin the flow is separated in two branches: one turns to the east and then southwards parallel to the coast, exiting Aegean from Rhodes–Karpathos straits; the other moves further north forming a double–gyre system, similar to the one proposed by HOPKINS (1978) (cyclonic to the West, anticyclonic to the East).

According to model results, the North Aegean sea, especially its eastern part, is an area of deep water formation, as suggested by various authors (LACOMBE *et al.*,1958; MILLER, 1974). A homogenization down to 600 m observed in February with minimum temperature value of 12.9 degrees, while in June in the same area the temperature of deep waters is 12 degrees, in total agreement with the observations of LACOMBE (1958). In both cases the salinity remains the same at these depths, near 38.7 psu. It seems that the deep waters of the North Aegean trough are not formed locally, since the lowest deep temperatures are observed in summer, but are produced remotely in the northern Aegean shelf area and are then advected to the deepest parts of the trough. These dense waters seems to move towards the southern Aegean through the relatively shallow (~400 m) plateau of Cyclades, as seen in the vertical transects across the straits that connect the North and South Aegean. As these waters move southward their characteristic signal decreases in strength and by the time they reach the Cretan Sea no observable sign persists.

Although in its present configuration the model is not eddy resolving, there are clear indications in the results, of a highly energetic mesoscale field associated with the general circulation especially in the northern Aegean. We are currently implementing an eddy resolving version of this model.

REFERENCES

BLUMBERG A. F. and G. L. MELLOR, 1987. A description of a three–dimensional coastal ocean circulation model. Three–Dimensional Coastal Ocean Circulation Models, Coastal Estuarine Sci., 4, edited by N.S. Heaps, pp 1–16, AGU, Washigton D.C. 1987

CASTELLARI S., N. PINARDI and A. NAVARA, 1990. A realistic general circulation model of the Mediterranean Sea. Part I: Surface energy parameterizations amd meteorological forcing data sets. IMGA–CNR Tech. Rep. 4-90, Modena, Italy.

HOPKINS T., 1978. Physical processes in the Mediterranean basins, Estuarine Transport Process, 269–307.

LACOMBE H., TCHERNIA P. and BENOIST G., 1958. Contribution à l'étude hydrologique de la mer Egée en période d'été. *Bull. Inf. COEC* 8 : 454–468.

LEGATES D.R. and C.J. WILLMOT, 1990. Mean seasonal and spatial variability in gauge–corrected, global precipitation. *Int. J. of Climatol.* V10 : 111–127.

MELLOR G.L. and T. YAMADA, 1982. Development of a turbulence closure model for geophysical fluid problems. *Rev. Geophys. Space Phys.*, 20 : 851–875.

OVCHINNIKOV I. M., 1966. Circulation in the surface and intermediate layers of the Mediterranean. *Oceanology*, 6 : 48–59.