O-II8

Wave evaluation in the Mediterranean Sea

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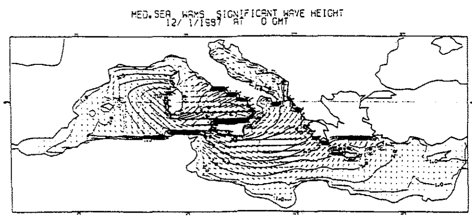
On a previous occasion we had reported about a project for the development of an advanced wave model. Wave models were born in the fifties, but up to recent times there was always some drastic short-cut in their theoretical approach. Only recently some drastic theoretical and experimental improvements, associated with basic experimental results and with the rapidity improving computer power, have allowed a complete physical formulation of the processes involved and their implementation in a mathematical model. The effort was anyhow too large for any single group, and the WAM Group was formed, involving all the major experts in the field.

The results are rapidly accumulating. A global model, with three degrees resolution, is run daily at the European Centre for Medium Range Weather Forecasts in Reading, U.K. Hindcast studies have been performed. We have mainly concentrated our attention on the Mediterranean Sea, where the phenomenology is more complicated than in the Open Ocean.

We have hindcasted several storms in the Mediterranean Sea, and we have found that the wind fields, strongly influenced by the bordering orography, lead to very complicated wave patterns. Also, the Mediterranean is not the nice calm basin that people from other areas like to think. The figure shows the wave conditions (isolines in meters) present during a remarkable storm which happened in January 1987.



In an attempt to estimate the reliability of the results, we have hindcasted this storm with different wind fields, from different sources and with different resolutions. The results are quite instructive, clearly showing how strong attention must be paid to the wind accuracy. We have found differences up to 30 % in modulus with strong bias in direction. The evidence is that, in a complicated basin as the Mediterranean Sea, local high resolution models are required for its evaluation. If not, not only the single event, but even statistics are likely to be substantially wrong.

O-III1

Hydrographic structure of the Mediterranean shelf waters off the Egyptian Coast during 1983-1986

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Throughout the period from August 1983 to July 1986, eight cruises were carried out using the Egyptian R/V Noor Ya Nabi to the Southeastern Mediterranean waters off the Egyptian Coast between long. 29°45 E and 33°45 E. Discrete samples from surface to bottom (up to 200 m) were collected from 180 stations, representing the coastal, middle and offshore waters, arranged along eight sections more or less perpendicular to the coast (Fig.1). The present paper deals with the hydrographic situation of the area based on data of corrected temperature, salinity and dissolved oxygen collected from the area during this period. The area of investigation receives about $17x10^9$ m^3y^{-1} of fresh, brackish as well as industrial and sewage waters from various land based sources.

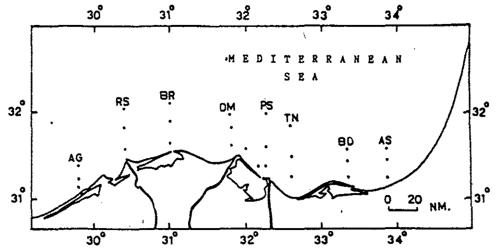

Figure 1. Area of investigation.

The usual three water masses known in the Southeastern Mediterranean were identified. The characteristics and range of each layer varied from previous records. The surface layer (salinity 38.70-39.00 ‰) extends to 75 m depth. The subsurface water layer of minimum salinity (38.64-38.90 ‰) and maximum oxygen (>5.2 ml/l) which is of Atlantic ocean origin extends between 50-150 m. The intermediate layer of high salinity (38.90-39.15 ‰) corresponding to the Levantine intermediate water mass extends below 150 m. These layers were normally characterised in summer and autumn season. During winter, T-S diagrams illustrated that the offshore area is a one water mass characterised by a narrow range of salinity (38.70-39.00 ‰) and temperature (16.5-18.0°C) due to winter convection and vertical mixing which may extend at least to 200 m depth.

The present data indicated that, at Damietta station (DM), in winter, a completely homogeneous layer occupies the 200 m and is characterised by a small range of temperature (Fig. 2). It has an isohaline water column of high salinity (>38.90 ‰) than that of its surroundings and a great homogenity in its σ_t values (>28.3). In spring distinct stratification occurs in the water column with the upper 25 m becoming less saline and warmer. In summer and autumn seasons, three layers were indentified ; the surface warm layer having salinity higher than April, the subsurface minimum salinity layer (50-100 m) and the intermediate maximum salinity layer (>150 m). These seasonal changes in the water column indicates a process of formation of intermediate water similar to that suggested by LACOMBE and TCHERNIA (1960) for the Rhodes-Cyprus region and MORCOS (1972) for the Egyptian Mediterranean shelf area. Consequently, the area in front of Damietta may be one of the regions of formation of the intermediate water of maximum salinity.

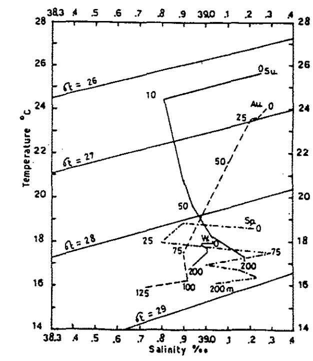

Figure 2. Seasonal characteristics of the T-S diagrams at Damietta station during the study period. (W = winter, Sp = spring, Su = summer, Au = autumn).

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