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An isopycnic study of the circulation in the different layers of the Eastern Mediterranean

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The large-scale circulation in three different strata of the Eastern Mediterranean Sea were studied using isopycnal analysis technique. The materials used are relatively homogeneous and new hydrographic data collected in the winter of 1977. According to a vertical salinity section representing the whole basin, three isopycnal surfaces were selected to perform the analysis. These surfaces are the σ_{θ} = 29.03 surface in the intermediate Levantine layer, the σ_{θ} = 33.55 surface (potential density referred to 1000 db) in the mid-depth layer and the σ_{2} = 37.84 surface (potential density referred to 2000 db) in the deep layer. Salinity, potential temperature and depth were looked at along these surfaces which produced new features of the circulation, particularly in the deep water.

The circulation of the intermediate water was characterized by a cyclonic movement in the Central Levantine basin and by an anticyclonic gyre in the Ionian basin East of Sicily (Fig. 1). In addition, there is a little indication of a westward movement of the saline Levantine water from the Levantine basin to the Ionian basin which might be considered consistent with the old picture of WUST (1960). The other features of the map are greatly in accordance with those found in OVTCHINNIKOV work (1966).

The gross feature for the mid-depth circulation (Fig. 2) is the existance of an anticyclonic eddy in the Levantine basin and an outflow from the Eastern Aegean Sea straits was indicated at depths of about 500 m near the straits. In the Ionian basin however there is a flow of relatively low-salinity water from a region Southeast of Sicily to the middle of the basin.

The circulation pattern in the deep layer (Fig. 3) indicated a spreading of low-salinity water from West of Cyprus to the Eastern border of the Ionian Sea. A limited flow of low-salinity water heading to the West was found in the middle of the Ionian basin. Such features differed entirely from those produced by WUST (1960) for the deep water.

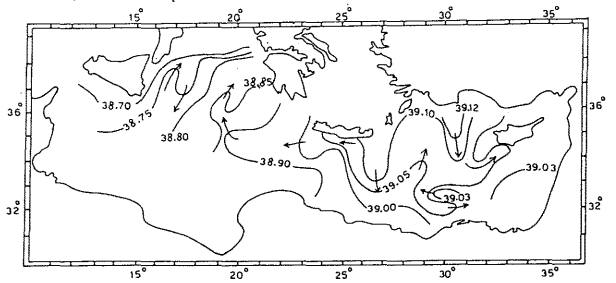

Fig. 1 Salinity (‰) on the σ_{θ} = 29.03 surface in winter of 1977.

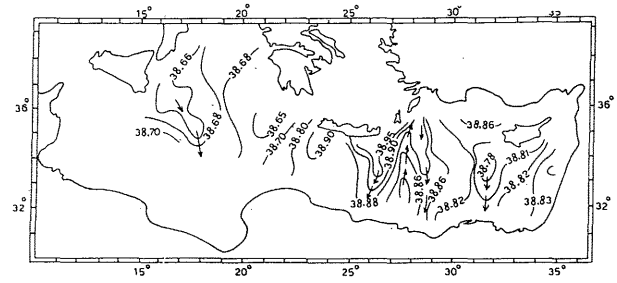

Fig. 2 . Salinity (‰) on the σ_{θ} = 33.55 surface in winter of 1977.

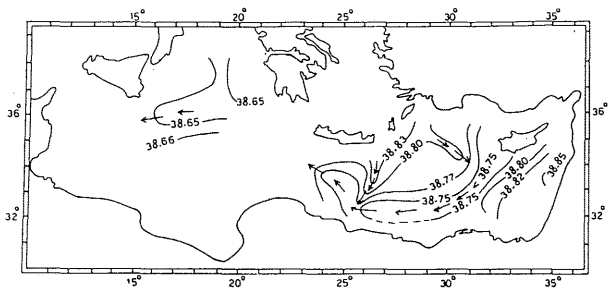

Fig. 3 . Salinity (‰) on the σ_{2} = 37.84 surface in winter of 1977.

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Atmospheric pressure forcing and low frequency sea level variability in the Northeastern Mediterranean

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ABSTRACT Time-series of one year of sea level data from eleven stations in the Northeastern Mediterranean (Adriatic, Ionian and Aegean Seas) have been analysed in terms of local atmospheric pressure forcing. The attention is focused on low-frequency oscillations having time scales from one day to several weeks but shorter than the seasonal scale. Summer and winter season have been analysed separately. An EOF analysis of both sea level and atmospheric pressure resulted in the separation of lower frequency oscillations of planetary wave time scale expressed by the first mode from the higher frequency synoptic time scale variability included in the second mode. The first mode is related to the in-phase sea level or atmospheric pressure variations in the entire area, while the second mode represents variations for which the Adriatic Sea is out-of-phase with respect to both Ionian and Aegean Seas. Only those first two modes represent a regionally coherent signal subtracting more than 90% of the total variance from both sea level and atmospheric pressure. Sea level EOF's are closely related to respective atmospheric pressure modes in both space and time. Departures from isostatic response, evidenced in the low frequency range of atmospheric planetary waves, are not due to geostrophic control in straits. It has been shown that the second mode time dependence is related to the surface pressure changes induced by the cyclonic activity in the study area. The location of the zero-crossing of the atmospheric pressure second mode over the area of Otranto Strait is being explained in terms of prevalent cyclone paths over the area of the Northeastern Mediterranean.

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