Heat storage in the Eastern Mediterranean

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The heat storage in the oceanic surface layers may be subjected to a considerable variability in space and time. In spite of the fact that the heat budget plays an essential role in the dynamics of the Ocean, only few works have regarded the heat storage in the Mediterranean (SAID, 1985 and PICCO, 1990).

The hydrographic data used retrieved from the WDC-A. It is made of about 1300 objectively tested TS profiles for the Eastern Mediterranean selected with a resolution of 0.5° square to obtain monthly mean profiles. Vertical resolution is that of standard depths. The heat storage were considered for the upper 100 and 300 m layers for the Eastern Mediterranean Sea east of Meridian, 20°E. Monthly heat storage (H) in J/m^2 has been estimated using the following relation :

$$H = 1/8 \sum (Cp_i + Cp_{i+1}) (\rho_i + \rho_{i+1}) (T_i + T_{i+1}) (Z_{i+1} - Z_i)$$

where:
Cpi: specific heat capacity in J/kg. °k (KorN, 1972),
ρ_i: water density,
T_i: water temperature,
Z_i: level depth,
Subscript (i) is refer to the i^{th} level.

The first layer includes the Mediterranean surface and Atlantic subsurface water masses. The upper 300 m layer contain the upper part or the Intermediate layer as well.

The monthly mean values of heat storage in both considered layers are higher in the Levantine basin than that in the Ionian and Aegian Seas (Fig. 1), due to the fact that the Levantine basin lies in a considerable lower latitude than the other two basins. Moreover, the vertical mixing in the Levantine basin, especially in its northern part, is more effective and may reach to more than 300 m depth. In these regions, the heat gained at the surface reaches to a considerable depths and then horizontally advected westward.

The amplitude of annual signal is greater with about 6% in 0-100 m layer than in 0-300 m in Levantine Sea, and with about 12% and 25% in 0-300 m layer than in 0-100 m layer for Ionian and Aegian Seas respectively.

Heat storage in the upper 100 m layer ranges from about 6.6 E9 J/m^2 in January to 8.7 E9 J/m^2 in October in Levantine basin. In the Ionian Sea, it ranges between 6.3 and 8.1 E9 J/m^2 in January and September respectively. It changes between 6.2 and 7.9 E9 J/m^2 in April and September in the Aegian Sea.

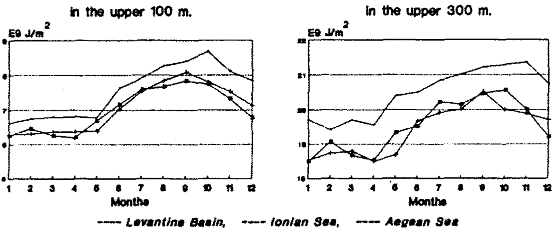

Fig. 1.- Monthly heat storage

In the upper 300 m layer, the heat storage ranges between 19.4 E9 J/m^2 in February and 21.4 E9 J/m^2 in November in the Levantine basin. In the Ionian sea it varies from 18.5 E9 J/m^2 in April to 20.5 E9 J/m^2 in September. In the Aegian Sea, it changes between 18.5 E9 J/m^2 in April to 20.6 E9 J/m^2 in October.

In general, the heat storage is higher and the period of heat storing is longer in the Levantine basin (Fig. 1).

According to the geographic distribution of the amplitude of annual signal, the minimum value, for both two layers under consideration, was observed in the northern Levantine basin while the higher values were found in the south SE of the same basin.

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