Heat Storage in the Western Mediterranean Sea

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Heat budget plays an importan role in the dynamic of the oceans. Several studies on the heat exchanges between the atmosphere and the sea surface and on heat and water budgets can be found in literature, but only few works regard the heat storage in the Mediterranean Sea.

In this work are presented some results which describe the geographical distribution of the heat storage in the first 100 m. of Western Mediterranean Sea, based on climatological data of sea temperature.

Data used come from the ENEA-CREA La Spezia (I) environmental data-bank. The WMTS (Western Mediterranean Temperature Salinity) data-set is made of about 12,000 TS profiles for the Western Mediterranean from 1911 to 1985 selected with a resolution of 0.5 degree square to obtain monthly mean profiles. Vertical resolution is that of standard levels.
Monthly heat storage in J/m^2 is computed by:

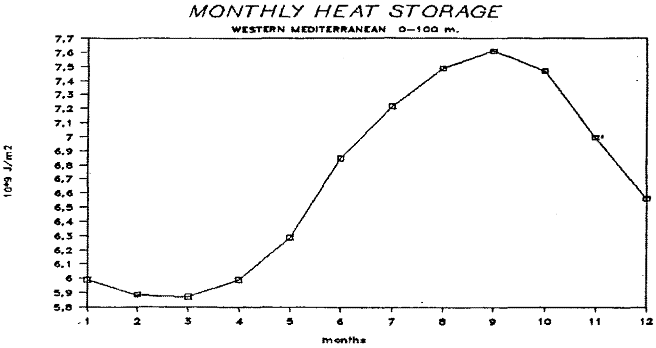
$$H= \rho \; Cp \sum_i 1/2 \; [T(i)+T(i+1)] \; [Z(i+1)-Z(i)]$$

ρ = 1,027 Kg/m^3 seawater density
Cp= 1,487 $J/Kg°K$ specific heat capacity
Zi= i-level depth
Ti= i-level temperature

The error assuming ρ and Cp constant is negligible compared with other sources of errors. Computation was performed for the 0-100 m. and for the 0-300 m. layers.

The annual trend of the monthly mean heat storage in the two considered layers for the entire Western Mediterranean shows that most of the heat storage variation occurs in the first 100 m. The amplitude of the annual signal for the 0-300 m. layer is only about 2% grater then the 0-100 one. Heat storage in the first 100 m. ranges from a minimum of 5.9 $10^9 J/m^2$ in March to a maximum of 7.6 10 J/m2 in September (Fig.1).

The geographical distribution of the amplitude of the annual signal shows an high variability (Fig.2). It can give an idea of the amount of the heat exchange in a region and it is in good agreement whit some general circulation schemas. Higher values (more then 2.6 $10^9 J/m^2$) are reached in the Algerian Provencal Basin; in the Alboran Sea, the inflow of Atlantic Waters makes the signal amplitude rather small (about 1.4 $10^9 J/m^2$). Low values are also found in the Ligurian Sea and in the Gulf of Lion (less then 1.6 10^9 J/m^2). Here the maximum of the heat storage is reached in October instead of September as in the other regions.



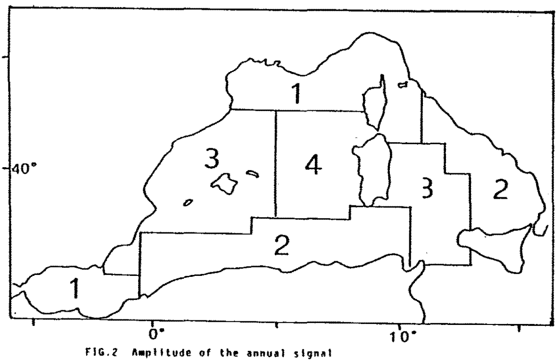


FIG.2 Amplitude of the annual signal

1 1.2-1.6 10E9 J/m2
2 1.6-2.0
3 2.0-2.4
4 2.4-2.8

References

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