A CONTRIBUTION TO THE STUDY OF THE CIRCULATION OF MEDITERRANEAN AREAS WITH A GEOSTROPHICAL LINEARIZED NUMERICAL MODEL

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In general the dynamical method which required only thermohaline measurement despite its inherent limitations is a useful tool for the investigations of geostrophic currents.

The ocean circulation can be schematized using two or more layers, each vertically homogeneous and of variable thickness.

For each layer, considered independently from the others introducing the stream function and the stationarity in the Euler equations we obtain:

$$J\left(\frac{\nabla\cdot\left(\frac{\nabla\psi}{h}\right)-f}{h},\ \psi\right)=0 \qquad (1)$$

where J is the Jacobian operator, ∇ is the gradient, $\nabla\cdot$ is the divergence, h is the thickness of the layer, f the Coriolis parameter, the water velocity $\bar{V}\equiv(u,v)$, $\psi_x=-hv;\ \psi_y=hu$

(1) is equivalent to

$$\frac{\nabla\cdot\left(\frac{\nabla\psi}{h}\right)-f}{h}=F(\psi) \qquad (2)$$

where F is an unknown function;
we have linearized as follows:

$$F(\psi) \simeq a + b\,\psi \qquad (3)$$

So we have an elliptical differential equation that is solved with the Cauchy condition.

To solve such equation we have used a numerical method. It is based on a finite difference shceme: it can use an irregular grid and is of implicit type.

In order to determine a and b in (3) we have made a best-fit between the experimental data and our results. We have worked in such direction with S. Garzoli (Lab. d'Océanographie Physique, Paris), on the data taken in the Hydromed II cruise. The data consist in about fifty stations destributed in the Sardinia strait region. There is a good agreement between numerical results and experimental data considering a constant value h.

At the moment, we are actually working with a more realistically variable h.

This method will be applied to the Ligurian Sea using the data of different seasons, collected by routine CNR oceanographic cruises.