

# Baroclinic vertical modes, energy content and distribution in the Northern Levantine, 1985-1987

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The vertical structure equation is solved to determine the vertical modal functions supported by the mean stability frequency distributions obtained from five general surveys in the Northern Levantine Sea during 1985-1987. The vertical structure functions are then fitted to the observed streamfunction distribution, to estimate the contribution of the modes to the circulation and energy distribution.

The vertical and horizontal distribution of energy components in the observed fields are calculated. The available potential energy is an order of magnitude larger than the kinetic energy and it increases at intermediate depths, while the kinetic energy has a maximum at the surface. It is generally found that the first baroclinic mode accounts for a large percentage of the observed motions.

The amplitude of motions in general decreases with depth. In summer, the motions are concentrated closer to the surface, while in winter the amplitude of the motions decay slower with depth. The typical first mode radius of deformation is on the order of 10-15 km, with the larger values occurring in summer and the smaller radius found in winter.

# The effect of the eddies on the inertial oscillations observed in the Otranto Straits

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Data collected from 12 Aanderaa shelf recording current-meters deployed in 5 moorings between 20/9 and 23/2/1979 have shown the existence of inertial oscillations in the Otranto Straits. Inertial oscillations have been observed and studied for the North Adriatic Sea, by Gacic and Yucak, 1982 and by M. Orlic, 1987. The defined shear zone, formed between the northerly flowing masses along the Greek coast and the southerly flowing masses along the Italian side (Ferentinos and Kastanos, 1988). The power spectra represent two broad maxima, one near the energy containing eddies and the other at the inertial frequency (Fig. 1). The observed inertial period was about 18.6 h and the radius of the inertial circles was about 0.9 km. The northerly travelling cyclonic eddies which have a period of about 10 days (Ferentinos and Kastanos, 1988), affect the inertial oscillations. The inertial oscillations are possibly generated by instabilities and equilibrium adjustment of the internal wave field (Kastanos and Ferentinos, 1988). The internal wave field appears highly energetic having a -1.74 mean slope, instead of the -2 universal power law. Assuming an f-plane, the vorticity field inside the eddies is positive (clockwise rotation), but in the region between the eddies the vorticity field changes to negative. The effective inertial frequency is then  $f' = f + \frac{1}{2}(U_x - U_y)$ , implying that  $f' > f$  for the region

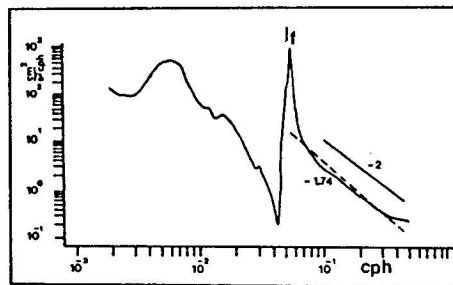


Fig. 1. Kinetic energy spectrum of a characteristic current-meter inside the shear zone

of positive vorticity and  $f' < f$  for the region of negative vorticity.  $U_y$  and  $V_x$  stand for the horizontal derivatives of horizontal current velocity and  $f$  stands for the theoretically estimated local inertial frequency. According to Meller, 1985, intensification and trapping of inertial waves occur within regions of negative vorticity, whilst within regions of positive vorticity the inertial loops are not allowed to be fully developed (Fig. 2).

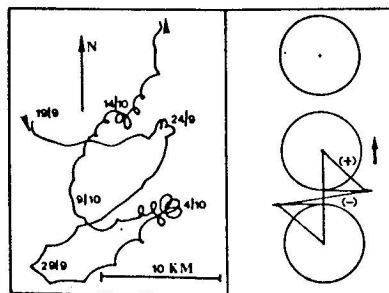


Fig. 2. The effect of the eddies on the inertial oscillations

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