General features of the Ligurian current inferred from the PROLIG 2 experiment

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This paper presents the analysis of current meter data collected in the core of the Ligurian current on 4 moorings at depths of 100m, 400m and between 800 and 1950m (PROLIG 2 experiment; May-December 1985).

Basic statistics (standard deviations, time scales, vertical complex correlations and spatial correlations) show differences at 100m between the May-September and the October-December periods; during this second period, the space and time scales of the structures decrease while the standard deviations increase. Spectral estimates were also calculated from one-month time series divided into 3 non-overlapping pieces; from this analysis, it appears that certain current fluctuations mainly occur from October to December, in agreement with satellite infrared observations. These differences are linked to the seasonal variability of the Ligurian current.

EOF analyses performed at each mooring show that only one mode accounts for ≈ 95% of the total variance; this mode, which is surface intensified, is such that the currents at all depths are roughly along the principal directions.

At 100m, the time scales of the u components (major axis) are ≈ 4-10 days during the first period and ≈ 3-6 days during the second one while those of the v components (minor axis) are ≈ 3-5 days during both periods. Spectral analyses, presented in the energy-preserving aera form, show that the u components at all depths display broad maxima at ≈ 10-20 days and ≈ 3-5 days all year long; the first frequency band is not evidenced on the v components for which the amount of energy in the ≈ 3-5 days band at 100m is larger than for the u component. These two bands probably correspond to different types of instability of the Ligurian current.

Coherences on the vertical in the ≈ 10-20 days band are slightly significant at 95% only between some pairs of records. At all locations and over the whole water column, the u components show high (significant at the 95% level) vertical coherences in the range ≈ 4-5 days with almost zero phase lags, while no significant coherences are computed for the v components. Therefore, the fluctuations of the Ligurian current, which are clearly characterized by periods of ≈ 10-20 days and ≈ 3-5 days, have relatively complex structures on both the vertical and the horizontal.

Correlations between moorings located ≈ 5km apart in the alongshore direction indicate that the velocity fluctuations propagate with a mean velocity of ≈ 10 km.day^{-1}. Cross spectra between these moorings provide significant coherences in the two above-mentionned frequency bands. For the lowest frequencies (≈ 10-40 days), the phase speeds are roughly ≈ 3-9 km.day^{-1}. In the other band (≈ 3-5 days) these phase speeds are ≈ 9-15 km.day^{-1}.

We complete theses analyses with satellite infrared images and applications of simple analytical models to provide a new insight on the Ligurian current's dynamics.

Flows and water mass exchanges between the Aegean and Ionian Seas through the Straits of Kithira and Antikithira (late summer, 1987)

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Circulation patterns in the region of the Western Cretan Straits and water mass distribution and exchange between the Aegean and Ionian Seas, in late summer 1987, are presented. The results are based on hydrographic and current measurements obtained on board R/V "Aegaio" in the framework of the POEM-5-87 major cruise. CTD data from 47 stations in the SW Aegean and Eastern Ionian are combined and discussed with current measurements from two moorings placed at Antikithira and Kithira Straits.

The surface layer is mostly occupied by waters of high salinity (38.90-39.26) with an exception in the NW Cretan Sea and Antikithira Strait, where waters of relatively lower salinity (38.85) are detected, coming from the N and W Aegean. The LIW occupies a thick (600-800m) intermediate layer on the Ionian side, while on the Aegean side waters of the same characteristics can be detected down to the bottom (1300m). The Deep Water of the Eastern Mediterranean is present only in the Ionian below 1200m.

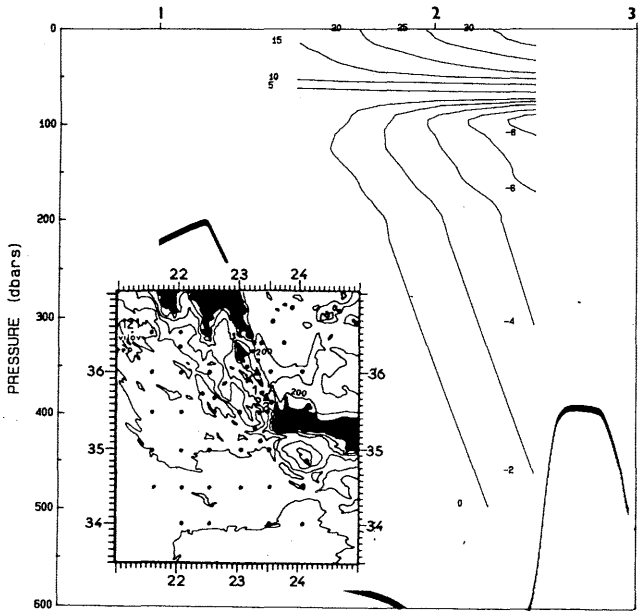
The surface dynamic topography relative to 500dbars reveals: (i) a large but relatively shallow cyclonic eddy southwest of Crete; (ii) the large and deep anticyclonic gyre, named "Pelops", southwest of Peloponnisos; (iii) an anticyclonic flow surrounding the islands of the Kitherian Straits and influencing the surface circulation in the Straits; and (iv) a cyclonic flow region in the western Cretan Sea.

Branch of the AW coming from the western Ionian and propagating towards the Levantine Basin is recirculated in the Ionian by the large cyclone SW of Crete. Portions of this AW are transfered by the existing anticyclone into the Aegean through the Kithira Strait. The "Pelops" anticyclone, on the other hand, entraps the core of the LIW and carries it in deeper layers (>500m).

Through the Antikithira Strait a surface (0-80m) outflow from the Aegean to the Ionian is indicated by both the geostrophic calculations (figure) and current measurements. The surface geostrophic velocities reach 30cm/sec while at 50m depth the geostrophic and currentmeter velocities show the same values, 12-15 cm/sec. At the Southern part of this strait in intermediate (300m) and deeper (700m) layers a rather weak inflow is observed with velocities decreasing with depth and ranging from 8 to 2 cm/sec

In the Kithira Strait an inlfow at surface is detected. The current measurements performed at the Aegean side of the strait show intermediate and deep currents with a westward component more pronounced. Velocities range between 5 to 10 cm/sec at 300m, while at 700m they do not exceed 3 cm/sec.

Apart from the above described flows through the Kitherian Straits, which correspond to the period of CTD measurements, a temporal evolution of current regime is derived from the long-term



Geostrophic Velocities in cm/sec across the Antikithira Strait (25 September, 1987)

(25/9-15/11/87) current measurements. The directions of the currents most of the time were steady during this period. At Antikithira Strait currents at 50m have a westerly direction with mean velocity 9 cm/sec, at 300m NNE direction with mean velocity 5.5 cm/sec while at 700m a SSE direction with mean velocity 3cm/sec. The above directions indicate continuous outflow at surface, weak outflow in deep layers and inflow at intermediate depths. At Kithira Strait (Aegean side) the intermediate (300m) and deep (700m) current measurements show that currents follow the bottom topography having a constant SSE direction and mean velocities 5.5 and 2 cm/sec respectively.