# 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.