Seasonal and Mesoscale variabilities of the Northern Current from the PRIMO-0 observations in the Ligurian Sea

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The PRIMO-0 experiment was carried out in the Corsican Channel, the Ligurian Sea and the Channel of Ibiza during about six months, from December 1990 till May 1991 in order to investigate the seasonal variability of the general circulation in the northern part of the western Mediterranean Sea. In the Ligurian Sea, 6 moorings (out of 9) supporting about 30 current meters (at ≈ 60, 100, 150, 250, 500, 1000, 1500 and 2000 m) were set in place as far as 30 nautical miles off Nice and were completed with a fortnightly hydrological survey at 13 equally-spaced stations; here we mainly deal with the current measurements. The observations were made simultaneously in the coastal area under the influence of the Northern Current and in the offshore area where deep water formation processes occur in winter, so as to emphasize likely relationships between these advective and convective phenomena (ASTRALDI and GASPARINI, 1990; MADEC *et al.*, 1991).

The most interesting result is that the monthly mean currents, computed at each mooring over the 250 upper meters, show that the Northern Current flows nearer to the coast and intensifies in February until mid March when it reaches its maximum. These features are different from what has been previously shown in the Corsican Channel where the Eastern Corsican Current is maximum in January (ASTRALDI and GASPARINI, 1990). Nevertheless, the intensification of the Northern Current at nearly the end of the deep water formation season migth support the link above-mentioned between these two phenomena.

The seasonal variability is well defined in both areas as previously observed (TAUPIER-LETAGE and MILLOT, 1986), it is characterized by an intense mesoscale activity in winter, especially from late December to February. In the coastal area, the mesoscale events are coherent over the whole width of the Northern Current. They are baroclinic and can reach depths of about 1000 m: they are associated with relatively large temperature fluctuations. On the outer edge of the current, these events become deeper and deeper from February until getting a barotropic structure in March over the whole 2000 m depth, while the monthly mean current becomes minimum: at this time the structure is characteristic of the offshore area.

A fine resolution on the vertical has revealed that current values down to 150 m in the Northern Current are similar: this upper part of the current reacts as a sole layer during the studied period. The mesoscale events, especially the more intense ones, have a characteristic signature on both current and temperature leading us to emphasize some aspects of their structure, these perturbations could be induced by instabilities of the Northern Current. From February to mid March these events weaken more or less everywhere while homogeneous low temperatures settle over both areas down to 150-200 m. At the end of March, the intensity of the mesoscale events is reduced and the stratification appears again. Since early May the mean current becomes relatively steady and it will remain like this till autumn (SAMMARI *et al.*. 1992).

Another interesting observation is that the current values close to the bottom, especially at the foot of the continental slope, are relatively large; for instance, the mean and 6-hour maximum values are ≈3 and 18 cm/s at ≈2000 m and ≈1 and 7 cm/s at ≈1000 m. This is coherent with observations made off Algeria (MILLOT *et al.*, 1992) and can be induced by interactions between the current and the topography.

So. the intensification of the Northern Current, its shorewards shift and the weakening of the mesoscale events in mid March, at the end of the deep water formation season, might bring enlightenments on the relationships between the general circulation and the convective phenomena.

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The Mediterranean Conveyor Belt

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Abstract

Multi-decadal integrations of the Pacanowsky, Dixon and Rosati version of the Bryan and Cox general circulation model have been carried out in order to study the characteristics of the Mediterranean conveyor belt. The model is forced at the air-sea interface by monthly mean atmospheric winds, air temperature and relative humidity to calculate bulk parameterized momentum and heat fluxes. Water fluxes are parameterized by a Newtonian relaxation term to monthly mean climatological surface salinities and the Gibraltar inflow condition is forced by an annual mean temperature and salinity structure.

The resulting overturning component of the thermohaline circulation can now be connected to the rather complex forcings of the general circulation, such as the air-sea interactions, the Gibraltar inflow/outflow system and the deep water sinking at northern latitudes (Gulf of Lyon and Adriatic Sea). We analyze the meridionally and zonally integrated mass transports in the western and eastern basins to examine the character of the overturning cell and its connection with the forcing at Gibraltar. Sensitivity experiments to different surface forcing parameters will be also shown.

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