AIR-SEA INTERACTION AND DEEP WATER FORMATION IN THELIGURO-PROVENÇAL SUBBASIN

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Abstract
The variability recorded at the bottom layers represents an important proxy in the study of climatic changes, so that the deep sea monitoring takes more and more important connotations in the study of formation and spreading of new water masses and their contribute in the thermohaline circulation. The long term monitoring performed between 2004 and 2009 in the framework of the ENVAR program carried out in the Liguro-Provencal subbasin, showed a strong and abrupt variation of bottom current lasting over three months. Previous analyses made on these data attributed this variation to processes of superficial water sinking. In order to better characterize this kind of process a new analysis takes more into account the surface heat flux and the relative buoyancy flux able to generate turbulence and convective instability

Keywords: Air-sea interactions, Ligurian Sea

During the ENVAR program several moorings were deployed along the Var canyon on a distance of about 100 km from the Nice coast (Fig.1).On winter 2006, a strong current variability was simultaneously recorded by all stations at the bottom layers, highlighting the occurrence of a mesoscale process whose effects interested avast thickness of the water column (about 500 m).The analysis up to now performed ascribed this abrupt variability to vertical movement of the water column pushed down by surface forcing. Due to the water sinking a renew of the bottom seawater was observed,in accord with ARGO results [*1*] that reveal the surprising presence of saltier and warmer deep water beyond 2000 m of depth. At the beginning of May 2006, the deep layers of Liguro-Provençal subbasin were enhanced with warmer and saltier waters, superimposing to the already existing warming trend concerning the Western Mediterranean Deep Water (WMDW), known since 1950s [*2*; *3*]. At today, all speculations made about the variations recorded at the bottom layers on winter 2006 are referred to vertical mixing processes as main responsibleof changes in the deep dynamic, although there is no evidence todiscriminate a contributions induced by lateral advection.The state of the art presented in this work consists in a new analysis taking into account the air-sea heat and the moisture fluxes responsible for change of the surface density and consequently of its buoyancy. The buoyancy loss rapidly impacts in the stratification of the water column. In fact, the destabilization of the buoyancy forcing produces a certain surface turbulence that, in turn, induce vertical movement and thus results in mixing. Current data are combined with some meteorological data (i.e.heat flux,wind, precipitation) in order to calculate the influence of the air-sea coupling in the triggering of dense water sinking process. It allows to definitely exclude horizontal advection that can also produce mixing of the water column and variation at the bottom layers.

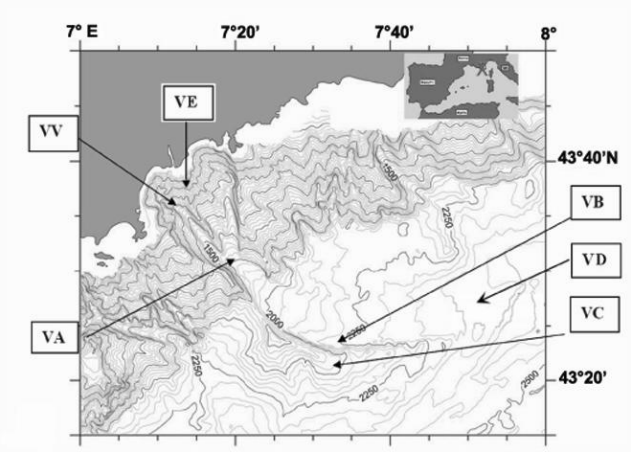

Fig. 1. Map of all mooring stations deployed along the Var canyon axis. VE, VV, VA and VB stations were moored inside the canyon system. VC stations was deployed on the levee outside the canyon, while VD station was located in proximity of the DYFAMED reference point.

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