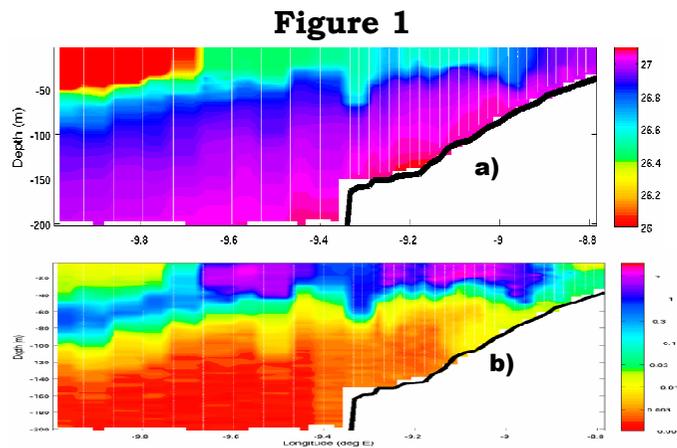
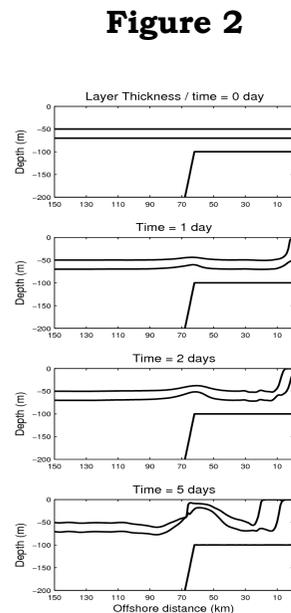


Effect of the wind on the dynamics of the shelf: formation of a secondary upwelling along the continental margin

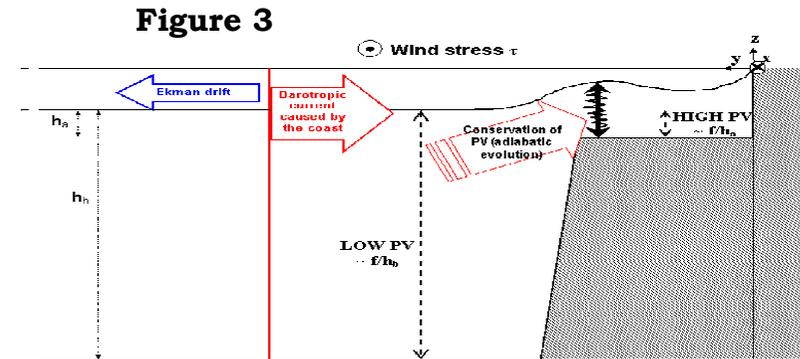
Observations during the MOUTON survey along the Portuguese coast in summer 2007 reveal the presence of two upwelling fronts, one being located near the shelf break. Both upwellings are characterized by deep cold waters close to the surface with high chlorophyll concentrations (see fig. 1 a b). Simplified numerical models are then built in order to study a possible physical mechanism behind this observation. First, a simple shallow water model with three distinct layers is used to study the formation of secondary fronts over the shelf break (see fig. 2) and its mechanism (see fig. 3). Sensitivity studies to several parameters have been done. Previous results are then extended to downwelling favorable conditions. Finally a more realistic configuration, with bottom topography, wind forcing and stratification set up from observations, is developed and the results are confronted to the observations. Although simulations overestimate the velocity amplitude, they exhibit good agreement in terms of density profiles (see fig. 4). The application and extension of the results to other more general oceanic regions is discussed and we conclude on the influence of such process on the dynamics of wind-driven circulation over a shelf.



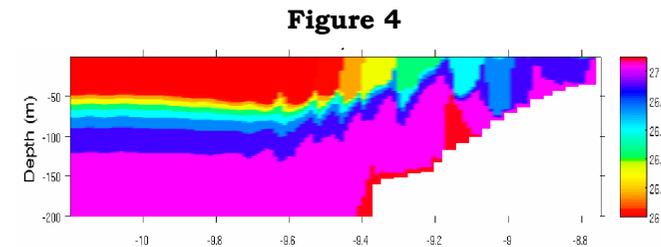
The Potential density (a) and LOG of chlorophyll a concentration (b) cross-shore section from *in-situ* data along 41°N (white lines = CTD casts, the thick black line = measured bathymetry).



Cross section of the layer interfaces at different times from the 2D academic configuration.



Schematic representation of cross-shore circulation generated by the wind and PVAd (dynamical Potential Vorticity Anomaly) mechanism. The advection by the barotropic onshore current of a fluid column generates a negative PVAd associated with a stretching of layer thickness at the shelf break.



Density cross-shore section after 6 days from the 2D realistic configuration built to check our hypothesis.

- Rossi, V., Y. Morel, and V. Garçon, 2009, "Effect of the wind on the dynamics of the shelf: formation of a secondary upwelling along the continental margin", **Ocean Modelling**, in revision.
- Rossi, V., Y. Morel, J. Tassel, P. Morin and V. Garçon, 2009, "MOUTON 2007: a field survey of the Iberian Peninsula Upwelling System", **Progress In Oceanography**, in preparation.
- Laura ANTOINE and Charlotte GRANGE, supervised by Vincent Rossi, Lars Stemmann and Gabriel Gorsky, 2008, "Spatio-temporal distribution of zooplankton in the Iberian peninsula determined by the Zooscan", Bachelor of Marine biology (performed at Laboratoire d'Océanographie de Villefranche sur Mer).