

ALMOFRONT 91 : An interdisciplinary study of the geostrophic frontal jet in the Eastern Alboran Sea

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The ALMOFRONT-91 cruise of R. V. L'Atalante, during May 1991, was devoted to study the geostrophic front which lies between Almeria (Spain) and Oran (Algeria) in the eastern part of the Alboran Sea. The oceanic density front was found on the left side of the geostrophic jet which constitutes the atlantic water inflow into the Mediterranean. The main objectives which guided the strategy at sea were:

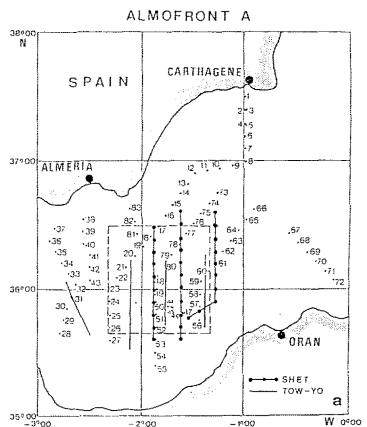
- 1/ to master the physical and dynamical parameters at a resolution that allows the calculation of vorticity and secondary (ageostrophic) circulation.
- 2/ to characterize the primary and secondary levels of the ecosystem in terms of stocks, production, growth rate, physiological stage or maturity .
- 3/ to evaluate the fluxes of matter in the frontal zone and the exports.

As revealed from the 83 CTD-rosette stations survey at synoptic scale (Fig. 1), the Atlantic jet was flowing along the Algerian coast with a 100 m thick, strong, horizontal density gradient and enhanced biomass along the flow (Fig.2). Phytoplankton composition as viewed by pigment analysis evidenced a strong upward supply of nutrients in the frontal zone. This upward flux was attributed to the secondary, ageostrophic circulation. The internal structure of the mass and velocity field was investigated by 4 CTD Tow-yo and ADCP sections through the main flow. A towed hydro-electric system (THES) which measured physical, biological and chemical variables by underwater probes and on pumped water, was operated between surface and 200m depth. This was repeated on three sections (Fig. 1) in order to reveal the nutrients, oxygen, biomass and pCO₂ fields as perturbed by the frontal zone. Subduction of dense water which is near surface north of the front below the light water of the jet is clearly signed, by anomalous vertical profiles of these chemical and biological variables.

A second, 15-day long leg was devoted to fluxes measurements in 6 sites representative of the frontal structure. The export of organic matter inside the frontal zone towards deep water is dramatically marked by the amount of matter found in drifting sediment traps. An subduction of water is also inferred from results obtained in 1990 inside a meander of the Ligurian Sea jet where mass and velocity fields are similar to those encountered in the Alboran sea jet.

The presentation corresponds to an overview of main results on the biophysical aspects of this study of which more 50 scientists participated.

Fig. 1.- Map of Almofront stations and Tow-yo transects for Leg A, April 26 - May 12, 1992. Dots with numbers indicate the position of the 83 CTD casts of the synoptic survey. The four lines correspond to the 4 Tow-yo transects across the frontal jet structure. Dots linked by thick line indicate the 31 THES stations.



DYNAMIC TOPOGRAPHY 0/400 dbrs

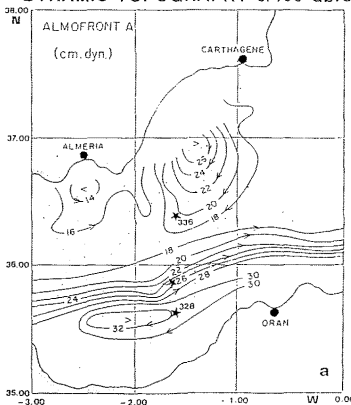


Fig. 2.- Results from the 83 stations of synoptic survey: Dynamic topography of the surface level relative to the 400 dbrs level. The south position of the jet and two eddies at north are clearly shown. The stars indicate the positions of the 3 THES stations which will be presented to evidence the subduction of the water, North of the jet front, southward and below the core of the jet.