

OBSERVATION OF MESOSCALE STRUCTURES IN THE ALBORAN SEA WITH ERS-1 SAR IMAGES AND DATA FROM ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) AND CTD

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The observation of surface mesoscale structures in the Alboran Sea has been addressed by analyzing Synthetic Aperture Radar (SAR) images from the ERS-1 satellite and ship data. The latter include Acoustic Doppler Current Profiler (ADCP) and Temperature Conductivity and Depth (CTD) data.

The Alboran Sea is the first Mediterranean basin encountered by the Atlantic Water (AW) which flows inward through the Strait of Gibraltar. Many experiments have shown a high variability of the AW circulation, both in space and time (GASCARD and RICHEZ, 1985). One of the most important features formed in the western basin of this sea is a big quasi-permanent anticyclonic gyre (DONDE VA? GROUP, 1984; LA VIOLETTE, 1986). Numerical studies have examined the existence of this gyre and indicate it might be related to the non-linear density advection off the Strait of Gibraltar (WANG, 1987).

At the eastern basin less information is available, although several studies have shown that a second anticyclonic gyre or an eastward current along the African coast is present (LA VIOLETTE, 1990; VIUDEZ *et al.*, 1994). Typical diameter of these two gyres is near 100 km.

The study was carried out with 26 SAR images SAR. FDC format that cover the Alboran sea from September 12th to October 14th, 1992. The ship data were obtained during an oceanographic cruise (FE92), performed on the Spanish R/V "Garcia del Cid" from September 17th to October 10th, 1992 and that included 134 stations. CTD casts in each station and continuous ADCP and surface T-S (Temperature-Salinity) alongtrack measurements were recorded. SAR images were reduced to a 512 X 512 pixel format and geolocated using the points supplied by ESA in each tape by means of an image processing system GEOJARS. This procedure was done in order to overlay the ADCP vectors on the images. The ADCP data were averaged every thirty minutes and maximum current velocities near 100 cm/s were obtained in some places.

Results in the comparison between SAR, ADCP and CTD data have shown a high correlation in the detection of mesoscale structures, especially the Western Anticyclonic Gyre, the baroclinic jet associated to both gyres and the eastward Algerian Current exiting the Alboran Sea. It is important to mention that some other structures, smaller in dimension as eddies and internal waves packets, are present in the SAR images.

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REFERENCES

- DONDE VA? GROUP, 1984. ¿Donde Va?, An oceanographic experiment in the Alboran Sea. The oceanographic report, Eos Trans. AGU, 65(36) : 682-683
- GASCARD J.-C. and Richez C., 1985. Water masses and circulation in the western Alboran Sea and in the strait of Gibraltar. *Prog. Oceanogr.*, 15 : 157-217.
- LA VIOLETTE P. E., 1986. Short term measurements of surface currents associated with the Alboran Sea gyre during ¿Donde Va? *J. Phys Oceanogr.*, 16 : 262-279.
- LA VIOLETTE P. E., 1990. The Western Mediterranean Circulation Experiment (WMCE). Introduction. *J. Geophys. Res.*, 95, (C2) : 1511-1514.
- VIUDEZ A., TINTORE J., HANEY R. L., 1994. Three-dimensional structure of the two anticyclonic gyres in the Alboran Sea. *J. Phys. Oceanogr.* (accepted).
- WANG D. P., 1987. The strait surface outflow, *J. Geophys. Res.*, 92 : 10807-10825.