A radio-tracked drifting buoys system for the study of mesoscale near surface currents in the Mediterranean

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The use of radio-tracked drifting buoys in the study of near surface currents has been introduced in different ocean regions in the last ten years (Davis et. al., 1982). The tracking from a ship of current dragged buoys, by means of directional reception of individual radio signals, allows an almost continuous positiong of several buoys in a relatively large area. An oceanographic vessel equiped with a calibrated rotating antenna and a radio direction finding system, can simultaneously follow the trajectory of a set of buoys while performing other research work. Fig. 1 is an example of a trajectory calculated from 59 different bearings of a surface buoy released on June 1989 in the area of the Balearic current. The successive triangulations are corrected from the error introduced by the time lag between consecutive bearings.

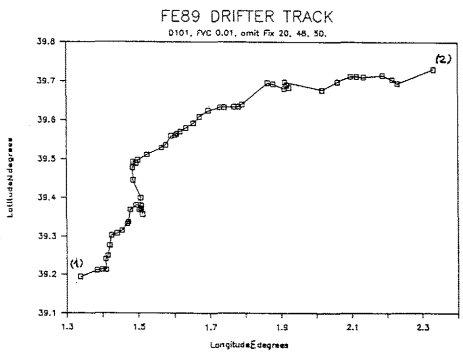

Fig. 1 Drifter trajectory obtained during FE89 cruise. Each calculated position is represented by a small square. Released (1) on June 14th 1989 at 12.49h and recovered (2) on June 18th at 12.52h

Our group (FEPOG) has been using this method in four different cruises since 1986 in the Catalan Sea (NW Mediterranean) where it has shown to be very useful in the study of mesoscale near surface phenomena, as frontal filaments (Wang et al., 1988) or inertial oscillations (Font et al., 1988; Salat et al., 1989). The space (few tenths of kilometers) and time (few days) scales typical of mesoscale processes in the Mediterranean make the system very suitable for such kind of studies in the region.

In the first two cruises, in cooperation with the Marine Sciences Research Center of the State Univ. of New York, we used drifters constructed by Lunar Electronics Co. (San Diego, U.S.A.), based on an original prototype by Russ E. Davis, and a receiving system developped in the Scripps Institution of Oceanography. Since 1988, in the frame of a Spanish research project (CAICYT PB86-0628), we have been developing a new system based on the same antenna commutation circuit structure, and used it in 1989 with a modified buoy model that kept the initial operating frequency band but introduced simplifications in the servicing of the buoy body.

Due to the fact that the original buoys were designed to operate in the 216 Mhz band, important interference problems can appear when using them in Europe, where that band is reserved to aircraft communications and navigation beacons. To have a system adequate for mesoscale studies in the Mediterranean, we have designed a complete new transmiter and direction finder that operates in the 430 Mhz band.

The new buoys, that have the same external shape and size in order to keep their dynamic characteristics, have been essayed during a cruse in 1990 with excelent results. Since the frequency of operation of the new system is aproximatively the double of the early one, the size of the direction finding antennas has been reduced to the half, allowing a more easily installed on board. We also took benefit from two other facts: First, the receiver noise level at 430 Mhz is lower than the corresponding at 216 Mhz. Second, since the size of the transmiter antenna is also the half of the one used at 216 Mhz, we have been able to design an antenna with higher efficiency without significative increase in its length. The result has been a very important increase in the signal to noise level for the same power consumption of the buoys. The effective range is actually limited by the Earth shape to 25 to 30 Km.

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