

Water fluxes across the Balearic Channels in June 1989. Doppler profiling and geostrophic computations

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The three Balearic channels close the Catalan Sea by the S and E, while by the NE it is open to the general southwestwards flow of the NW Mediterranean. By means of regional water and salt budgets, Bethoux (1980) calculated this inflow to have an annual mean flux of 0.8 Sv. Some 0.4 Sv should leave the basin through the southern sill, while other 0.4 Sv return to the Liguro-Provençal basin by the N of the islands.

After an extensive analysis of hydrographic data, Font et al. (1988) concluded that the circulation in the Catalan Sea is controlled by two shelf/slope fronts. The main southwestward flow continues alongslope the Liguro-Provençal current from the Gulf of Lions, with a flux ranging from 1.5 - 2 Sv in winter to 1 Sv in summer. The outflow through the southern channel was estimated to be lower, especially in summer. Very variable exchange has to occur through the other two and less deep sills. A return current to the NE contours the Balearic continental shelf, and its flux was calculated to be of the order of 0.5 Sv off Mallorca.

During a cruise of the Spanish R/V "García del Cid" in June 1989, high horizontal resolution (2 to 5 miles) CTD and ADCP sections were performed in the three channels and in the northern edge of the Catalan Sea.

ADCP profiles down to about 350 m (without pitch and roll compensation) were averaged every 5 minutes, both during CTD stations and underway. Absolute velocity values were calculated by bottom tracking over the continental shelf or by a reference level of zero velocity at 300 m. A reasonably good match between the two methods was observed in all the sections. Four hours of ADCP profiling close to an Aanderaa mooring allowed an intercalibration of both types of current-meters at three levels: mean differences in speed were in the range of 2 to 4 cm/s.

This first ADCP survey in the region evidenced the frontal jet character of the southwestward flow along the peninsular slope; with a strong weakening in the southern part (Font & Castellón, 1989). Maps of current vectors at different depths in the four border sections (e.g. fig.1) show the inflow and outflow patterns as it would be expected at the beginning of the summer in the surface layer (Font et al., 1988). In the northern section the Catalan (to SW) and Balearic (to E) frontal currents are clearly present. The irruption of Modified Atlantic Water by the Balearic sills is a remarkable feature, together with the very low outflow in the south.

Although the analysis of all the ADCP data has not been completed, a quite good agreement has been found, on both velocity distributions and transport in the surface layer, with geostrophic computations. Water flux values in the four sections have been calculated as: 0.9 Sv Catalan current inflow, 1.2 Sv Balearic current outflow, 0.05 Sv inflow in the northern channel, 0.1 outflow (north) and 0.5 inflow (south) in the central channel and 0.3 outflow (west) and 0.2 inflow (east) in the southern channel.

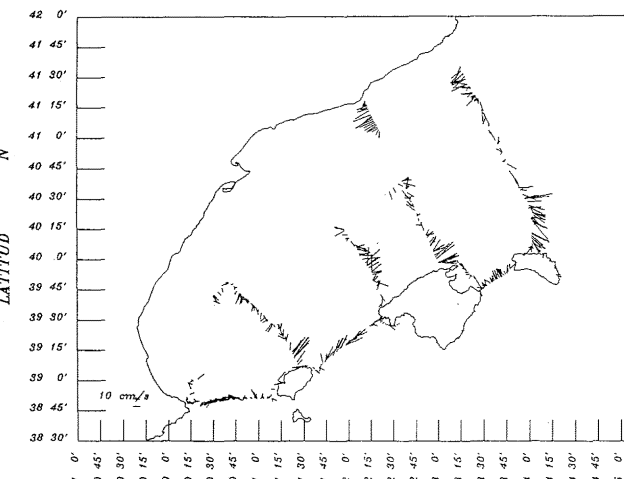


Fig.1 Rough ADCP velocities at -30 m measured in June 1989

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