Inertial waves and tidal motion in the Ibiza Channel

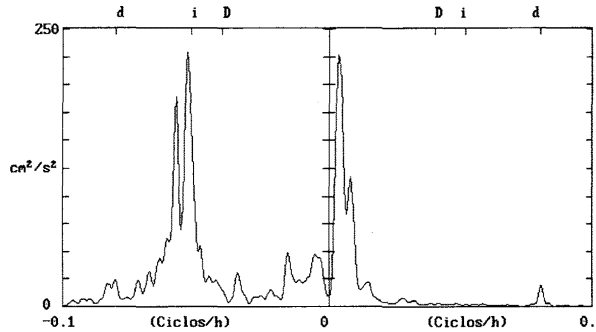
Natalio CANO*, Federico FERNANDEZ*, Jesus GARCIA# and Juan AGUIAR#

*"Instituto Espanol de Oceanografia", Puerto pesquero, FUENGIROLA (Malaga)(**España**)
"Departamento de Fisica Aplicada II", Universidad de MALAGA (**España**)

From the fifteenth of November 1990 to the twenty fourth of July 1991, and as a part of the programme "Dynamic Study and Biological Production of the Ibiza Channel", six current meters were moored in the Ibiza Channel (38°49.3' N, 0°47.9' E) at depths, 90, 115, 165, 265, 465 and 715 meters, in order to study the water mass fluxes through the Channel.

Current meters were placed in two successive moorings, the first one goes from the beginning to the fifteenth of March 1991 and the following one from the twentieth of March 1991 until the end.

Preliminary results from the analysis of the recorded data are presented here. Well differentiated peaks close to the inertial frequency and a weaker one, related to the semidiurnal tide, are observed in the spectrum (See Figure). Tidal ellipses have practically degenerated in straight lines, as it can be observed in both, figure and table.



Rotatory spectrum (negative frequencies correspond to the clockwise rotation) at 115 m. depth.
Letters **d** and **D** denote the semidiurnal and diurnal frequencies bands, respectively; **i** corresponds to the inertial frequency.

A harmonic analysis at the various depths shows a no very intense signal but easily detectible corresponding to M_2, clearly barotropic and with the tidal ellipse oriented according to the N-S axis of the Channel (See Table).

Table: Tidal current ellipses of the M_2 constituent in the Ibiza Channel (38°49.3' N, 0°47.9' E). Phase is referred to Greenwich meridian. A denotes anticlockwise rotation. C clockwise rotation.

Depth (m)	Major semiaxis (cm/s)	Minor semiaxis (cm/s)	Orientation (0° eastwards)	Phase	Rotation
90	1.3	0.2	104	138	A
115	1.6	0.0	93	145	-
165	1.5	0.2	102	144	C
265	1.8	0.2	91	144	C
465	1.5	0.2	93	145	C
715	1.4	0.2	65	147	C

The spectral analysis shows a more intense inertial peak centred at 0.054 c/h., a 4 percent larger than the local inertial frequency (0.052 c/h.), with clockwise rotation sense.

A previous analysis of this peak of frequency indicates a phase propagation for these waves of the order of 0.01 cm/s. The vertical wave length is of the order of 200 m.

Inertial currents are more intense at the three first levels of depth, decreasing very rapidly below the 200 m. level.

A particular characteristic of the spectra, more noticeable at the three superficial levels, is the appearance of a second peak on the frequency 0.058 c/h. which we think is due to a modulation of period $(0.058\text{-}0.054)^{-1}$ hours (10 days approximately) in the inertial waves, related possibly with the variations in the wind impulses.