

"VARIATIONS OF THE SEA LEVEL IN THE WESTERN MEDITERRANEAN FROM THE
INFORMATION GIVEN BY THE MAREOGRAPHS"

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ABSTRACT

L'Estartit's mareograph is a classic mareograph of float located in the port of this locality of the north Catalan coast. It has a very extensive record of more than ten years of information of the level of the sea, on which there has not carried out practically any treatment that allows to obtain information about the tide as much astronomic as meteorological in this zone of the Mediterranean. In the present tesis there has been realized the harmonic analysis of all the available information of measurement of l'Estartit's mareograph, as well as the prediction of the astronomic tide for the same period of time of measurement of the mareograph, being able to be obtained hereby records of meteorological tide. To realize the harmonic analysis and the prediction of astronomic tide has been used the program designed by Foreman M. G. G. in 1979 and additional programs have been created in language Fortran for the correct treatment of the information. On the other hand, for the correct understanding of the tesis there is described the theoretical formation of the astronomic tides, as well as the process followed to realize the harmonic analysis of a data record of sea level measurement and the prediction of the astronomic tide from the results obtained of the harmonic analysis. Finally, from the obtained results and the information of measurement of the mareograph, it is possible to characterize the tide in l'Estartit's zone and extract several conclusions of the behavior of the astronomic and meteorological tides in the zone, as well as the behavior of the average level of the sea measured by the mareograph along more than ten years of measurements. Thus a mixed, predominately semidiurnal, tide is obtained as expected result, for the zone of the Mediterranean in which l'Estartit is. Components of bigger amplitude, and that therefore have major importance in the astronomic tide, are components diurnal and semidiurnal that in the equilibrium tide already present a bigger amplitude: M₂, S₂, K₁ and O₁. It is important to emphasize components of frequency low than the diurnal S_a and S_{sa} who present considerable amplitudes, especially in case of S_a, component of bigger amplitude of the included ones in the analysis. This supposes a great influence, in the astronomic tide of the zone, of the annual variation of the distance of the Earth to the Sun and of the annual variation of the Sun declination. The hourly behaviour of the meteorological tide is alike that of the atmospheric pressure, so that the low levels of the meteorological tide coincide with high pressures, and vice versa. This confirms to us that the meteorological tide in this zone of continental narrow platform is determined by the effect of reversed barometer, though the differences that should be observed between both phenomena will be due to other atmospheric phenomena. Concretely is observed that in May, June, July and August the behaviour of both phenomena is similar enough, whereas in other months as November or December there appear more differences of behaviour, which leads us to think that the presence of storms can affect enormously the levels of meteorological tide on having taken associated strong winds and important surges. It is observed for the diverse years as the hourly records of meteorological tide of June, July and August they are soft, practically constant, whereas in January, February, November and December the graphs present important peaks and valleys, product of the importance of the atmospheric phenomena in these months. The hourly extreme levels, as maximum as minimums, of the sea level and of the meteorological tide are given to final and at the beginning of year, approximately between October and March. The great coincidence of days can be observed in the extreme values of both phenomena, which confirms the importance of the meteorological tide in the extreme values of the level of the sea, logical enough thing if we think that the order of magnitude of the tide amplitudes is of cm, as the values of meteorological tide that are observed: these they reach, in the period of twelve years of record, an hourly maximum value of 56 cm and a minimum of -33 cm with regard to the level of the sea determined by the astronomic tide. They are considerable values that they can not be despised, since the low levels of the sea level can affect, for example, the navigation of crafts in the entry ports and the high levels of the average level can be associated with stormy phenomena with important surges that provoke floods in maritime avenues. As for the behaviour of the average monthly levels of the measured data it can be observed as the minimal and maximum levels concentrate in the beginnings and the end of year, respectively, being the possible reason the change of temperature and salinity of the sea water throughout the year and the long period harmonics. In this decade of measurements a light ascent can be observed of the average annual sea level of approximately 3.0 cm, with years with the unusually high sea level, as the year 1996, 1997 or 2001.