SEA LEVEL OBSERVING SYSTEM IN THE WEST-WESTERN MEDITERRANEAN. IN THE PURSUIT OF THE LONG-TERM CHANGES IN SEA LEVEL. CONTRIBUTION TO MEDGLOSS

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Abstract

The sea level observing system presented in this paper is operated under the responsibility of the Instituto Español de Oceanografía (IEO). It cover not only the strait of Gibratar: Ceuta (35° 00'N, 05° 36'W) in the African Coast, Tarifa (36° 00N, 05° 36'W), Algeciras (36° 07'N, 05° 19'W) in the European Cost, but also two other stations close to the strait: Cádiz (36° 32'N, 06° 17'W) in the Atlantic and Málaga (36° 43'N, 04°25'W) in the Mediterranean. Furthermore, the station in Palma de Mallorca (39° 33'N, 02° 38'E) is also included in this system and Ciudadela will be operative very soon. All the station fulfil the GLOSS requirement and European Sea Level Observing System [1, [2] and even in the stations of Ceuta and P. Mallorca there are (will be) installed a permanent GPS, under the IGN responsibility, for a continuos land monitoring [3]. The time series cover the period (1944-1999), except for P. Mallorca, but there are some lags. At present, the complete period can not be used for the long-term change because there exist some inhomogeneities in the time series, then it is not possible to know that in this part of the Mediterranean the trend reduction after 60's [4, 5] have been occur, but the present analysis shows lower trend than in the Atlantic and even in some stations the trends are negatives. During this decade (90's), the sea level has been increased somewhat more than in the 80's in most of the stations.

Key-words: Sea Level, Time series, Global Change, Western Mediterranean.

Technology and methodology

At this time, the complete sea level observing system, consist in 6 permanent tide gauge stations, 1 (or 2) permanent GPS stations and two Data Centres, in the IEO and IGN respectively, fig. 1. Concerning to the sea level, the measurement equipement is a mechanical float gauge with a digital output system facility in addiction to the graphical output. The data are received in the Data Centre in near real time by modem. The stations around the peninsular coast are linked to the National Geodetic Levelling Network. The mean sea level in P. Mallorca and Ceuta are the references for the Levelling Network of the Island of P.M. and the City of Ceuta respectively. The locations of these two stations are very strategy for the spatial sea level topography. For that reason, these stations are included in MEDGLOSS. The sea level data are received in the Data Centre and a systematic quality control is performed at annual basis, by using the USLC software [6]. Later on in order to found the inhomogeneities in the whole series, the Alexandersson's homogeneity test, SNHT [7], has been performed station by station. Then, with the reference homogeneous station for the region, the Craddock's test (1979) it is performing and the vertical land movements will be remove by using the correction given by Peltier [8],[9], for the final results.

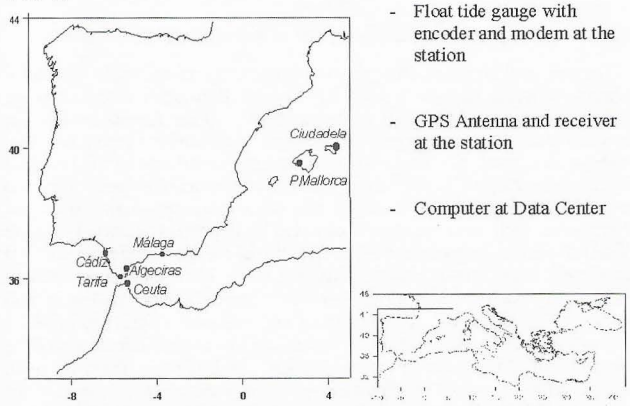

Fig. 1. Network. Geographical position and technology.

Discussion of the time series

In fig. 2, the Alexandersson's test shows: two inhomogeneity indicators in Málaga (1961,1978), one in Algeciras (1956, 1990), two in Tarifa (1957, 1991). The dates when the inhomogeneities occur are corresponding, mainly, with changes in places or equipement according to the historical notes of each station. The trends have been calculated for the homogeneity periods as presented in fig. 3 and table 1. The Craddock's test is been processing taking into account the results of the previous analysis and the historical notes, for cross-checking.

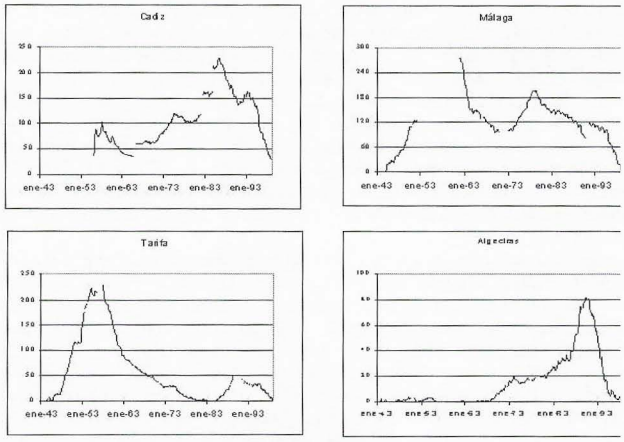

Fig. 2. Alexanderson test. Pointer of inhomogeneity

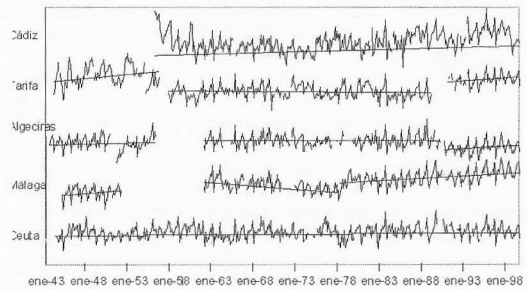

Fig. 3. trends by station and by period.

Table 1. Mean sea-level trend by period and stations.

Station	Period	trend mm/yr	station	Period	trend mm/yr
Cádiz	Feb 56-Dec 99	2.18	**Ceuta**	Mar 44-Dec 99	0.55
Tarifa	Jan 44-Aug 56	7.52	**Málaga**	Jan 45-Feb 52	7.47
	Oct 57-Mar 91	-0.62		Jan 62-Apr 78	- 6 .66
	Apr 91-Dec 99	5.80		May 78-Dec 99	4.99
Algeciras	Jan 43-Mar 56	1.81			
	Jan 62-Dec 90	-0.06			
	Jan 91-Dec 99	4.90			

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