ANNUAL TO DECADAL SEA LEVEL VARIATION (35N-52N, 10W-13E)

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Abstract

Monthly mean sea level values from tide gauges have been analysed for the area (35N-52N, 10W-13E) in the ESEAS-RI (WP3.1) project framework. Standard quality control procedures have been applied to the data and Fourier and Empirical Ortogonal Functions (EOF) analysis has been performed to the data set. Stations have been grouped in 6 region (number of significant series has been reduced from 35 to 10) obtained by EOF.

Keywords: EOF, time series analysis, mean sea level.

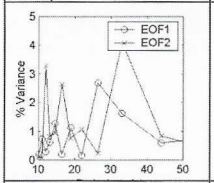
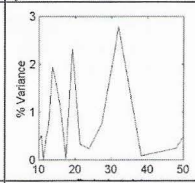
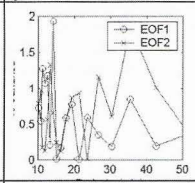
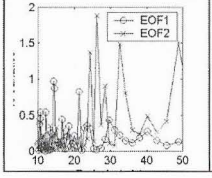
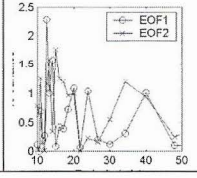
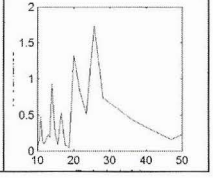
Monthly mean sea level values from the tide-gauge stations located in the area (35N-52N, 10W-13E) are analysed. Data come from the Permanent Mean Sea Level Service (PSMSL). Series of Ceuta, Cadiz, Algeciras, Tarifa and Malaga come from the IEO Data Centre because during the last years a big effort in quality control has been done, in particular in homogeneization of time series. In some cases, series has been cut in shorter ones because there are shifts along them.

Linear trend are calculated and removed at each station. Some trend values are very suspicious, probably because the sea level signal is contaminated by the instability of tide-gauges location. The clearest example is Dieppe, where its trend is bigger than other records in its area. Negative trend at P.St. Gildas and Gibraltar correspond to flagged records with stability problems. In addition, trend values depend strongly on length records. The GIA rate (1) has been used to remove the Post Glacial rebound. Annual cycles have been calculated too, and removed by subtracting means monthly values to the record anomaly.

Fourier analysis has been performed in order to identify long-period significant cycles in the detrended and deseasonalizated series. The contribution of a given frequency to the total variance of the time series is a measure of the importance of that particular frequency component in the observed signal.

EOF analysis has been done to classify the set of variables in several groups that keep common characteristics and behaviour. These groups are defined performing an EOF of a bigger area and selecting the more explicative variables. St.Helier, P.St.Gildas and Cadiz stations are eliminated in this analysis due to stability problems. In each group, the first EOF accounts for the main part of total variance in the data, the second EOF holds the maximum variance that has not been accounted by the first EOF, and so on. The kept EOF factors at this work explain, at least, 75% of total variance. As a result of this analysis, an important data reduction has been achieved. This few new variables can be used for interpretational purposes or in further analysis.

Table 1. Groups and EOFs found in the performed analysis.

ENGLISH CHANNEL 11.00, 2.50, and 1.20-1.50 years.	**GULF OF BISCAY** 5.33, 2.67, 1.60 and 1.14 years.	**IBERIAN ATLANTIC COAST** 8.87 and 5.62 years.
		
STRAIT OF GIBRALTAR 28.50, 14.25, 11.40, and 8.14 years.	**WESTERN MEDITERRANEAN** 10.00, 6.67, 1.18-1.67 years.	**CENTRAL MEDITERRANEAN** 11.75, 2.14, 1.68 years
		

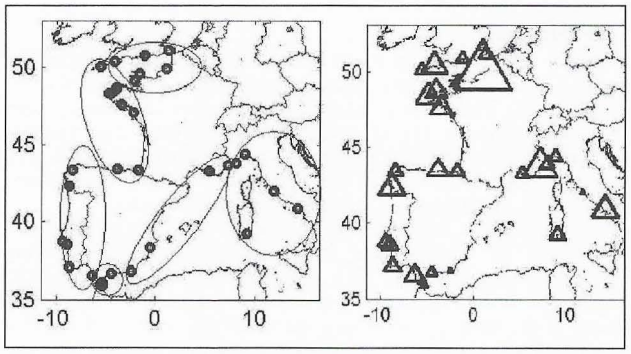


Fig. 1. Regions defined by EOF and trend values with the corresponding PGR corrections.

References

1 - Peltier, W.R., ICE4G (VM2), 2001. Glacial Isostatic Adjustment Corrections. In : Douglas, B.C., Kearney, M.S., and S.P. Leatherman (eds.), Sea Level Rise; History and Consequences. Academic Press.