



Low frequency Sea Level Variability: correlation between altimetry and tide gauges in the Mediterranean Sea

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Sea level variability in the Mediterranean Sea over the decadal time scale is studied using a combination of sea level and in-situ observations. A method to decompose the different sea level signals for tide gauges and altimetry is proposed, so that a coherent comparison between the two measurements is possible. The steric component and the atmospheric pressure contribution (inverse barometer) are filtered in order to look at sea level changes over decadal time scales.

Low frequency sea level from tide gauges data is found to be representative of a large scale signal and results to be comparable, along all the basin, with satellite altimetry data. In particular the two signals are better correlated in the areas where the continental shelf is extended, such as the northern Adriatic. The same occurs in the case where the tide gauge station is located on an island, such as Malta, where the station is representative of the open ocean sea level signal. Moving towards the Levant basin, the shelves extension generally decrease and the two data sets tend to be less correlated even if still correlated positively with a root mean square error lower than 5 cm (Hadera, Israel).

Looking at the sea level trend, a positive trend of 2.15 ± 0.7 mm yr $^{-1}$ is observed in the Mediterranean basin considering satellite altimetry during the period from 1993 to 2010. Glacial Isostatic Adjustment (GIA) has been considered correcting sea level data with ICE-5G model data. This value represent just and index of the sea level changes occurring at basin scale. The basin presents a marked trend spatial variability, mainly characterized by strong positive trends in the shelves areas and negative trends in the Ionian sea, due to a strong change in the circulation in this basin. The variability of the trend values as a function of the number of years considered is such that at least 15 years of data are needed in order to obtain a significant and stable positive trend.

The total lack of in-situ data in the southern part of the basin represent a major point of weakness of this study and in general affects the significance of the studies about sea level in the Mediterranean sea.