



Sea level trend in the Mediterranean: closing the budget

Mirko Orlic (1), Mira Pasaric (1), Zoran Pasaric (1), and Michel Rixen (2)

(1) Geophysical Department, Faculty of Science, University of Zagreb, Zagreb, Croatia, (2) World Climate Research Programme, World Meteorological Organization, Geneva, Switzerland

We analyze sea level changes in the Mediterranean in the second half of twentieth century and evaluate the input from each contributing process, with the final goal to close the budget of the observed sea level trend. Long-term, high-quality tide gauge data collected in the Mediterranean, in the Black Sea and along the western Iberian coast, corrected for the glacial isostatic adjustment (GIA), are used to construct regional sea level in the different sub-basins and in the Atlantic off Gibraltar. Sea level changes induced by direct atmospheric forcing are estimated from the air pressure reanalysis data with the response function taken from the literature. Thermosteric and halosteric changes are calculated from the measured temperature and salinity data. Finally, global mass contribution is estimated from the data collected in the Atlantic close to Gibraltar. Linear trends of the time series are then determined. While doing so, it is essential to accommodate the autocorrelation within the time series, which is achieved using Bayesian statistics.

The trends indicate that sea level in the Mediterranean was rising and that the rise was much faster in the Black Sea and in the Atlantic. However, regional processes (direct atmospheric forcing and steric changes) led to lowering of sea level throughout the Mediterranean and in the Black Sea. On the other hand, the global mass addition from the Atlantic surpassed the regional processes, leading to an overall sea level rise. The estimated mass-induced rise accounts for the discrepancy between the regionally induced lowering and the observed rising and thus enables the budget of sea level change in the Mediterranean and Black Seas to be closed.