

The role of local and external factors in determining the interannual sea level variability of the Adriatic and Black Seas during the 20th century.

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The Adriatic Sea and the Black Sea are two semienclosed basins connected to the Mediterranean Sea by the Otranto and the Bosphorus straits, respectively. This work aims to reconstruction the sea level for both basins in the 20th century and to investigate main sources of interannual variability. Using 7 tide gauge timeseries located along the Adriatic coast and 5 along the Black Sea coast, provided by the PSMSL (Permanent service of mean sea level), a seamless sea level timeseries (1900-2009) has been obtained for each basin on the basis of statistical procedure involving PCA and Least Square Method. The comparison with satellite data in the period 1993 – 2009 confirms that these are reliable representations of the observed sea level for the whole basin, showing a great agreement with a correlation value of 0.87 and 0.72 for Adriatic and Black Sea respectively. The sea level has been decomposed in various contributions in order to analyze the role of the factors responsible for its interannual variability. The annual cycles of the local effect of pressure (inverse barometer effect IB), of the steric effect due to temperature and salinity variation and of the wind effect have been computed. The largest contribute for the Adriatic Sea is due to the wind, whilst inverse barometer effect plays a minor role and the steric effect seems to be almost negligible. For the Black Sea, on the contrary, wind effect is negligible, and the largest source of variability is due to the Danube river, which is estimated from the available discharge data of Sulina (one of the exits of the Danube delta. Steric and IB effects play both a minor role in this basin. A linear regression model, built considering as predictor the SLP gradient identified at large scale after having carried out the correlation analysis, is capable to explain a further percentage of variability (about 20-25%) of the sea level after subtracting all the factors considered above. Finally, residual sea levels show a positive correlation (0.42 about) revealing the likely action of a common boundary forcing associated to the mass exchange with Mediterranean sea. The present analysis is still unable to explain a non-negligible fraction of interannual variability of sea level, in particular for Black Sea. This is likely to a substantial extent due to uncertainties of hydrographic data caused by their irregular distribution in space and time and on the lack of regular records of past river discharge. This study is part of the activities of RISES-AM project (FP7-EU-603396).