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Adriatic and Black Sea level in the 20th century and projection to the end of the 21st century.

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Adriatic and Black Sea are semi-enclosed basins characterized by densely populated coasts, industrial compounds and a rich cultural and historical heritage. It appears to be crucial, for the management and the protection of their coastlines, to understand how much they will be impacted by the global sea level (SL) rise, projected by the end of this century. The aim of this work is to develop a method that allows to estimate to which extent the SL of the two basins will depart from the mean global level. The future evolution of global sea level is not a meaningful indicator at this regional scale and past deviations, due to local factors of the Adriatic and Black Sea levels from the global one, have been observed.

The Adriatic Sea is the basin of the Mediterranean Sea best covered by past SL observations. In fact, for the Adriatic Sea is possible to obtain, by statistical method based on PCA and Least square Method, a seamless and long time series (from 1900 to 2009) using records of 7 mareographic stations located along the Italian and Croatian coasts (from PSMSL database). Satellite data of SL are available for the whole Mediterranean from 1993 to 2012 and they show a very high correlation (rho > 0.9) with Adriatic time series based on mareographic records. The SL time series of the 20th century in the Black Sea is computed using data of 4 stations, which are available in the PSMSL (Permanent Service for Mean Sea Level) archive, located on the north-east coast. This time series shows a lower correlation (rho about 0.5) with satellite data than in the case of Adriatic Sea. Further it shows a higher interannual variability. All the time series are considered after the subtraction of the Inverse Barometer (IB) effect.

A statistical approach, based on a multivariate linear regression model, is used to investigate the link between SL anomaly, computed as the difference between the regional SL and global SL, and three large scale climate variables (sea level pressure, air temperature and precipitation). The linear model at a monthly scale provides a good reconstruction of the past variability in the case of Adriatic sea, but presenting substantial differences in the reconstruction skill between cold and warm seasons. Reconstruction is substantially worse for Black Sea. Always the main factor reproducing the signal variability is represented by the mean sea level pressure. The model forced by predictors extracted from CMIP5 multi-model simulations, finally provides the projections of SL anomaly until 2100.

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