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Common behaviour of the Adriatic and Black Seas level in the 20th century as response to a Mediterranean forcing.

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The Adriatic and Black Seas are two marginal seas, both connected with the Eastern Mediterranean Sea, through the Otranto and Bosporus straits respectively. This contribution aims to evidence the fraction of the interannual sea level variability that is common to the two basins, likely an effect of the common forcing produced by Mediterranean Sea. In order to identify the common signal, the effect of the main local factors (wind, inverse barometer effect, steric effects, river runoff) determining the larger fraction of the interannual sea level variability have been identified and subtracted. Using 7 and 5 tide gauge timeseries located along the Adriatic and Black Sea coasts respectively, provided by PSMSL (Permanent Service of Mean Sea Level), two seamless timeseries representing the sea level of the basins from 1900 to 2009 have been produced. The comparison with satellite data, between 1993 and 2009, confirms that these reconstructions are representative of the actual sea level in the two basins (values are 0.87 for the Adriatic and 0.72 for the Black Sea). When considering local factors, for the Adriatic Sea the annual cycle of inverse barometer effect, steric contribution due to local temperature and salinity variations, and wind set-up have been computed. For the Black Sea, the wind factor (negligible in this case) has been replaced by the Danube river contribution estimated from the available discharge data of Sulina (one of the exits of the Danube delta). After subtracting these local factors from the observed sea level of each basin, the correlation between the residual time series amounts to 0.47, suggesting the presence of a common factor acting at Mediterranean scale, which can be attributed to the effect of the large-scale circulation on the mass exchange between the Mediterranean and the two local basins. The present analysis is still unable to explain a non-negligible fraction of interannual variability of sea level of the 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 to the lack of regular records of past river discharge for most rivers contributing to the Black Sea.