



Links between Sea Level in the northern Adriatic sea and large scale patterns

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The study analyzes the link between Northern Adriatic sea level (SL) and three variables: sea level pressure over European and North-Atlantic area (SLP), Mediterranean sea surface temperature (SST) and Mediterranean sea surface salinity (SSS). Sea level data are provided by monthly values recorded at 7 tide gauges stations distributed along the north-Italian and Croatian coasts (available at the PSMSL Permanent Service of Mean Sea Level). SLP data are provided by the EMULATE data set. Mediterranean SST and SSS data are extracted from the MEDATLAS/2002 database. The study shows that annual sea level variations at Northern Adriatic stations are very coherent so that the northern Adriatic sea level can be reconstructed since 1905 on the basis of only two stations: Venice and Trieste, whose data cover almost the entire 20th century (whereas Croatian data cover only the second half of the century). The inverse barometric, thermosteric and halosteric effects provide the physical basis for a local relation of SL with SLP, SST, SSS implying, if other effects are absent, a sea level increase for increasing temperature and decreasing atmospheric pressure and salinity. However, the statistical model used to quantify the link between SL and these three forcings shows that they have produced no important trend and they cannot explain the observed trend of Northern Adriatic Sea level during the second half of the 20th century. The observed trend can therefore be interpreted as the superposition of land movement and a remote cause. Using SLP, SST and SSS from climate model simulations, no trend is obtained during the 20th century, as well. The same model simulations, considering their continuations for the 21st century show that local effects (mainly warming of water masses) are likely to produce an increase of about 10cm (with a large uncertainty) at the end of the century. The global signal and the regional land movements have to be added to this result to obtain the actual relative sea level rise.