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Low frequency Mediterranean sea level variability. The contribution of atmospheric pressure and wind.

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We examine 44 years (1958-2001) of extensively validated sea-level model data with the aim of characterizing the atmospheric contribution to low frequency (the seasonal cycle and lower) Mediterranean sea level variability. The sea-level data set was produced by Puertos del Estado within the HIPOCAS Project framework, by means of a long-term barotropic run of the HAMSOM model, with a 1/4º x 1/6º spatial resolution. The atmospheric pressure and wind fields used to force the 44-yr ocean hindcast were produced by dynamical downscaling (1/2˚ x 1/2˚) from the NCEP/NCAR global reanalysis, using the atmospheric limited-area model REMO.

Results show that during the examined period, the effect of the atmospheric forcing has been in the sense of lowering sea level at a rate of about -0.6 mm/yr, mainly due to an increase of atmospheric pressure over the region. This effect is specially marked in winter (-1.3 mm/yr) and less marked in summer (-0.2 mm/yr). As a consequence, the amplitude of the seasonal cycle would have increased by about 2 cm during the second half of the XX century. The winter decadal variability is well correlated to both the North Atlantic Oscillation (NAO) and the Mediterranean Oscillation Index (MOI), while in summer it is only correlated with the MOI. A modal decomposition shows a basin-wide leading EOF (66% of variance explained) that implies the existence of a related flow exchange through Gibraltar.

This work is undertaken in the framework of the VANIMEDAT project, which is aimed to draw a complete picture for each of the components of Mediterranean Sea level variability (atmospheric forcing, steric component and mass changes).