CLIVAR-SPAIN CONTRIBUTIONS: Atmospheric contribution to Mediterranean sea level variability under different climate change scenarios

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We investigate the contribution of atmospheric pressure and winds to Mediterranean sea level variability under different scenarios of greenhouse gases (GHG) emissions (B1, A1b, and A2). The analysis focus on low frequency processes (monthly time scales and lower) and also on extreme events.

The results for the XXI century indicate that the contribution of atmospheric pressure and winds to Mediterranean sea level would be negative, with a decrease that would be especially strong in winter. The trends obtained for the XXI century are of up to ~0.8 mm/year in the central Mediterranean under the A2 scenario. Trends in summer are barely significant but positive, then leading to an increase in the amplitude of the seasonal cycle. The interannual variability shows a widespread standard deviation increase of up to 40%. An increase in the frequency of positive phases of the NAO explains part of the winter negative trends. Also, an increase in the NAO variability would be responsible for the projected increase of the interannual variability. Conversely, the intra-annual variability (1-12 months) does not show significant changes.

Concerning the extreme events, results reveal a reduction of 50% in the number of episodes and up to 8 cm in the 50-year return levels. The analysis shows a progressive decrease in the return levels not fully explained by a negative trend in the mean atmospherically-induced sea level and a linear dependence with winter NAO. Likewise, negative events show an increase in their frequency and magnitude although more moderate than for positive surges.