



## **Mediterranean Sea level and barotropic flow through the Strait of Gibraltar for the period 1958-2001 and reconstructed since 1659**

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Sea level values from a 2D model of the Mediterranean Sea forced by atmospheric pressure and wind are used to estimate the barotropic flow through the Strait of Gibraltar for the period 1958-2001. The Mediterranean mean sea level derived from the model ranges between  $\pm 20$  cm with a standard deviation of 5.5 cm, and is correlated to the NAO Index. Thus NAO historical data and reconstructions are used to derive the Mediterranean Sea level variability from 1659 until 2001. The accuracy of the reconstruction is estimated in 2.7 cm for monthly mean values, 0.41 cm for annual mean values and 0.22 cm for decadal mean values (0.48 cm for decadal winter mean sea level). The barotropic flow through the Strait is computed from the model output as the time derivative of the total volume of the basin. During the period 1958-2001 the estimated daily flow ranges between  $\pm 2.7$  Sv, with a standard deviation of 0.56 Sv. The dominant periodicities are in between one and two weeks. At these scales the model successfully reproduces previously published flow estimates based on current meter observations, which confirms that atmospheric pressure and wind dominate the intra-seasonal variability of the flow. For the annual cycle, the variability of the atmospherically induced flow is similar to the variability of the flow induced by the Evaporation-Precipitation (E-P) budget ( $\pm 0.025$  Sv), though absolute values of the first are about a third of the latter. At longer time scales, the atmospheric contribution is much smaller than the E-P induced flow