



## **The present state and long term variations of the Black Sea wave power**

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The importance of marine energy sources is widely recognized, but still underdeveloped in the European semi-enclosed seas. Due to possible future developments in such low energy environments with the advance of the technologies, many studies of the wave power potentials for these seas were recently performed. The available estimations of the wave power potential of the Black Sea are based on the usage of reanalysis wind data (ERA Interim and NCEP reanalysis). The usage of such low resolution input data has its limitations and results in significant biasing of the results. In the present study we revisit the wave power potential of the Black Sea using wind data with high spatial resolution from the limited area atmospheric model ALADIN to force SWAN wave model and estimate the wave power. The wave model results are compared with satellite altimetry data and it is shown that the usage of ALADIN winds significantly improves the results for the significant wave heights (the major source of errors in wave power estimations. We base our estimation of the wave power potential on the recent 4 years hindcast due to the temporal consistency of the atmospheric model for the selected period. The main find is that the wave power potential of the Western Black Sea coasts is significantly higher than the previously estimated by other researchers (in order of 5 kW/m for some locations of the Western Black Sea coast). Otherwise the conclusions of the other researchers about the spatial distribution of the wave power are confirmed. Next we evaluate the long term variations of the Black Sea mean annual wave power based of 110 years wave hindcast, using wind data from ERA-Clim reanalysis and the relation of these variations with the atmospheric teleconnections patterns (such as North Atlantic Oscillation). Low frequency variation of the Black Sea wave power is identified that correlates with the low frequency oscillations of the teleconnections.