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## Spatio-temporal Modelling of Significant Wave Height and Wave Energy Potential Estimation in the Aegean and Ionian Sea

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The continuous search for affordable and renewable energy resources is a topic of interest for decades. Many large-scale measuring campaigns have been conducted and various different tools have been developed over the years (both numerical and statistical in nature), in order to locate regions with high wind, wave and solar energy potential. Depending on the energy resource, not all regions are performing equally, as expected. To pinpoint regions with high energy gain requires state-of-the-art tools and unremitting research efforts.

The objective of the current research effort is the spatio-temporal wave data analysis, originated from satellite data, and sensor buoy data scattered in the Aegean and Ionian Sea, with the use of geostatistical and dynamic downscaling methods, for estimating the wave energy potential for the Hellenic region. The main areas of interest are the Aegean and Ionian islands, with unsustainable energy production.

WRF model is used to dynamically downscale coarse global climate model output to provide the regional wind forcing for a 40-year hindcast period on a 3 x 3 km grid over the Aegean and Ionian Seas. The calculated wind forcing is used as a driver for the WAVEWATCH-III wave model to calculate the significant wave height and period in the region and subsequently achieve a high-resolution estimation of the wave energy potential spatial distribution and temporal evolution. Model results have been validated with mooring time series of wave parameters in the Aegean Sea and satellite-based along track Significant Wave Height data available through CMEMS Wave Thematic Assembly Center (CMEMS WAVE TAC). To strengthen the results outcome, a spatio-temporal geostatistical methodology has been introduced to validate the computational results and provide a fast and robust estimation of the wave and energy fields. The results between the two different approaches are compared in order to establish either spatial or temporal correlation patterns.

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