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Dynamical Downscaling of Wind Surface Forcing with Application to the Wave Potential Estimation in the Aegean Sea

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Over the last decade, a lot of work has been performed to develop wind-wave potential prediction techniques that, effectively and within realistic time-frames, map the local climatology of a specific region. The combination of local and satellite climatic data, has been used, for good reason, in many wind-related-projects as it is linking mesoscale meteorology, with microclimatic weather phenomena. This way the driving geostrophic winds are effectively taken into account for the estimation of low altitude wind distribution.

Using dynamical downscaling methodology, a nesting technique with 1/3 ratio is applied to downscale the raw computational grid of the satellite input data to a finer 3 x 3 Km results grid. This way, higher computational accuracy is achieved over the investigated regions, thus revealing finer wind scales phenomena. For the computational simulations, two different models have been used in order to generate meteo-climate parameters suitable for sea-wave results calculation: a dynamical downscaling model (at regional scale), and a wave model. The first model performs the downscaling of the satellite meteorological data in higher resolution grids for a wide area of the Aegean Sea. The produced fine grid output drives the later wave model in order to estimate the significant wave height and period over the areas of interest. The produced results will later be used in conjunction with novel geostatistical techniques to estimate the wave energy potential distribution in the Aegean and Ionian Sea.

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