Offshore wind power in the Aegean Sea - DTU Orbit (04/11/2019)

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The wind climate of the Mediterranean Sea has been estimated from atmospheric modelling (Cavaleri 2005, Lavignini et al. 2006) and QuikSCAT (Furevik et al. 2011). The latter shows the Aegean Sea as a promising area for offshore wind power development. According to the Hellenic Wind Energy Association (HWEA), the sites of particular interest for offshore wind energy are located close to the mainland and islands in the Aegean Sea. Wind farm developers aim to select local areas with favorable wind conditions to optimize the annual energy production and the economic profit. In the Aegean Sea, where the spatial variations in wind speed are very high, accurate resource mapping is of great importance as the produced wind power is proportional to the cubed wind speed. It is challenging to model the wind resource and it is costly to measure from the ground at every place of interest. Maps based on Synthetic Aperture Radar (SAR) are expected to prove valuable for the exploitation of the excellent wind resource of the Aegean Sea, to the benefit of the national economy. High-resolution SAR satellite data bring new information for pre-feasibility for instance at the policy planning level. For accurate wind resource mapping from satellite it is necessary to collect many images to reduce the uncertainty. The 10-year Envisat ASAR archive has been used for wind resource mapping. Wind maps from satellite are retrieved at 10 m. DTU Wind Energy has developed a method for extrapolation of winds to turbine hub heights at around 100 m using a combination of satellite wind fields and the long-term climate of atmospheric stability from the mesoscale model (Badger et al. 2016). The result of the mean wind speed at hub-height for the Aegean Sea is shown in Figure 1. The map shows the stability dependent winds (SDW).

It is planned to combine the Envisat wind fields with Sentinel-1a and Sentinel-1b wind fields to further detail the offshore wind resource within the New European Wind Atlas. The work is in progress. Sentinel-1a images are processed at DTU Wind Energy near-real-time and we are updating our wind resource software. A service-based on satellite SAR-derived winds for wind resource estimation is available at DTU Wind Energy. The project was supported by ESA ResGrow and satellite data from ESA Envisat and Copernicus Sentinel-1.

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