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Abstract

Satellite images, spanning January 2005 to January 2012, from ESA’s Envisat Advanced Synthetic Aperture Radar (SAR) were used to investigate the wind energy offshore Iceland. In total 2500 images were calibrated and the wind speed calculated using the CMOD5N geophysical model function, on a 1x1 km grid. The wind direction used was taken from the US Navy Operational Global Atmospheric Prediction System (NOGAPS) model. It has much lower spatial resolution and therefore the model wind directions are interpolated in space and time before performing the SAR-based wind retrieval. Off the northern coast this analysis resulted in around 400 overlapping images but only 200 off the more data sparse southern coast.

Wind resource statistics of mean wind speed, Weibull scale and shape parameters, and energy density have been calculated using the Satellite-WAsP (S-WasP) program. The individual wind maps from SAR reveal a multitude of atmospheric phenomena off the complex coastline, including lee effects and gap flows in the fjords. The wind resource statistics shows the mean wind speed to range from 5 to 8 m/s at 10 m height above the sea level. Specific areas for case study are being selected for further investigation.

SAR-derived wind maps have the advantage of covering the coastal zone. Further offshore the SAR-derived winds will be compared to the NORA10 atmospheric model results and scatterometer winds. In Iceland the wind resources on land are promising for wind energy application but not yet exploited on a significant scale. This analysis of the offshore wind resource is useful as pre-feasibility study in case this clean energy resource is to be exploited at a later stage. The work is part of the Nordic Icewind project.

Further reading


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