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OFFSHORE WIND RESOURCE ASSESSMENT THROUGH SATELLITE IMAGES

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A case study from Horns Rev in the North Sea is used to demonstrate a method for the estimation of the offshore wind resource. The study is based on satellite Synthetic Aperture Radar (SAR) data from the European satellite ERS-2 and covers the period May 1999 to October 2001. A number of processed satellite scenes providing wind speed and wind direction are used as input to the new software available for the calculation of wind resources. The software is called RWT (Risø Wemsar Tool) which will soon be part of the WASP Utilities programme.

The wind from satellite data is calculated as a weighted sum of several image pixels located upwind of the reference point. Surface-layer theory offers such weighting functions, traditionally called footprints, and three theoretical footprint models are implemented. Extraction of wind data is done for 62 available satellite scenes resulting in a set of wind speed and direction records applicable for prediction of the wind power resource at the Horns Rev site. The satellite winds are valid for the 10m heigth. Extrapolation to wind turbine hub height is unnecessary since this is integrated in wind power predictions programs such as WASP. The available data series is relatively short and sparse data set affects the statistical precision of the predicted wind speed distribution. The maximum-likelihood method seems particularly useful for the Weibull fitting, since it accounts for wind speeds that are deemed out of range of the CMOD algorithm. In modelling the Weibull shape parameter, data from all directions are used for the estimation, then assuming this as representative for all directions. Acknowledgements: ESA AO-153 and EO-1356 for ERS-2 SAR scenes and Elsam Engineering for met-data.