Norsewind wind atlas: Satellite derived wind atlas

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Norsewind wind atlas: Satellite derived wind atlas

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Introduction

The FP7 project Norsewind (2008-2012) focused on the offshore winds through observations with

• ground-based lidar
• offshore meteorological masts
• satellite remote sensing
• mesoscale modeling

One of the key products is wind atlas based on satellite data.
Rationale for satellite data

The NORSEWINd project (2008-12)

• Northern Seas Wind Index Database

• Combining the strengths of different data types to a state-of-the-art offshore wind atlas for the wind energy industry
Satellite SAR – synthetic aperture radar

Wind resource mapping from satellite wind fields

DTU Wind Energy, Technical University of Denmark
Envisat ASAR scenes in the NORSEWInD project - and the 10-m wind atlas from SAR
Comparison of SAR and mast winds at 10 m

Horns Rev M2

- $R^2 = 0.85$
- RMSE = 1.33
- $y = 0.97x$
- N = 143

Egmond aan Zee

- $R^2 = 0.80$
- RMSE = 1.44
- $y = 0.90x + 0.61$
- N = 188
Comparison of SAR and mast winds at 10 m

Wind speeds from SAR and 5 masts in the North Sea

Horns Rev M2 and Egmond aan Zee give stability dependent winds (SDW)

Spatial wind variability over the North Sea

QuikSCAT

winds <5 m/s

winds >15 m/s
QuikSCAT – spatial correlations

Horns Rev M2
FINO-1
Egmond aan Zee
Greater Gabbard.
QuikSCAT versus four met-masts

GG is Greater Gabbard
EAZ is Egmond an Zee

ASCAT versus WRF (wind speed)

Number of ASCAT passes used for comparisons with the WRF model outputs (left) and mean bias between ASCAT and WRF.
ASCAT and QuikSCAT scatterometer mean wind speed

Access to wind resource maps

The maps are
Number of samples
Mean wind speed
Weibull A parameter
Weibull k parameter
Energy density

Maps at

The results are based on 9000 Envisat ASAR WSM wind maps collected and processed by CLS and DTU Wind Energy.

Also QuikSCAT and ASCAT maps are available and WRF results.

See www.norsewind.eu
Access to wind resource maps

The maps are:
- Number of samples
- Mean wind speed
- Weibull A parameter
- Weibull k parameter
- Energy density

select Norsewind.

The results are based on 9000 Envisat ASAR WSM wind maps collected and processed by CLS and DTU Wind Energy.
Access to wind resource maps
Conclusions

• Based on satellite SAR and scatterometer Earth Observations maps of many statistical parameters are calculated including mean wind speed, Weibull A and k, uncertainty estimates, spatial correlation, etc.

• Comparison to met-mast data and WRF results performed

• Lifting of satellite winds to hub-height is on-going (beyond the project)

• The satellite-based wind resource maps for 10 m height are publically available at
http://soprano.cls.fr
www.norsewind.eu

Report: Hasager et al. 2012 Norsewind satellite wind climatology, DTU Wind Energy-E-0007(EN), Roskilde, Denmark