

Satellite-based wind resource map

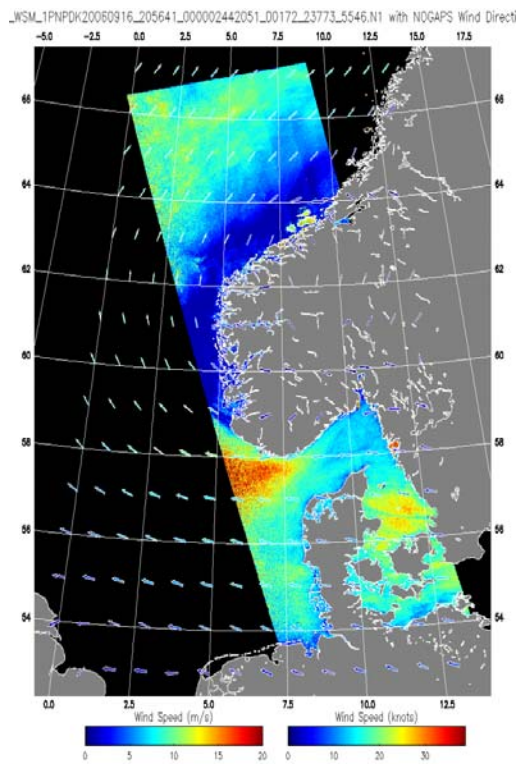
Satellite-WAsP (S-WAsP) is developed for wind resource mapping based on satellite images.

Satellite images

Satellite images from the European Space Agency (ESA) are retrieved from Envisat ASAR. The radar images are collected day and night and through clouds and rain, thus coverage is ensured at every pass. In wide swath mode each image covers a 400 km wide swath. Through ESA's EOLISA archive it is possible to check the number of available images for any location.

Wind mapping

Radar backscatter is related to ocean wind speed through empirical functions taking into account the viewing geometry and the wind direction. In physical terms, it is the capillary and short gravity waves at the ocean surface formed by near-instantaneous winds that are related to the radar backscatter signal observed from the satellite. Using the near-real-time wind mapping software of the Johns Hopkins University Applied Physics Laboratory (JHU APL) ocean wind maps are produced.



Wind speed map covering seas in Northern Europe based on Envisat ASAR from 16th September 2006 at 20:56 UTC. The arrows show winds from the U. S. Navy Operational Global Atmospheric Prediction System (NOGAPS).

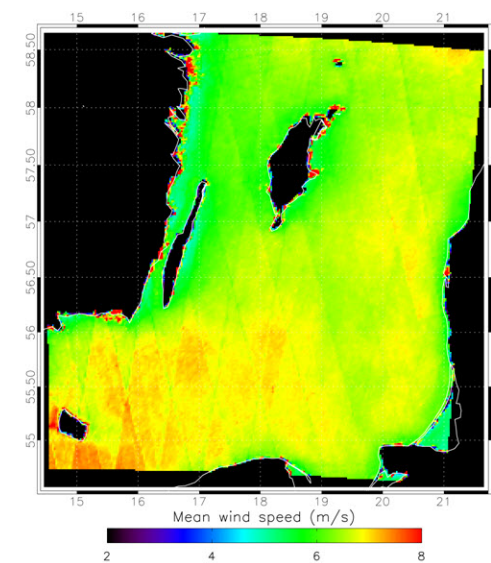
Wind resource map

Each ocean wind map is geo-referenced. The spatial resolution is around 1 km by 1 km and the map covers the coastal zone from around 2 km and further offshore. Using a series of wind maps in S-WAsP enables calculation of the wind resource statistics for the site or region covered.

The statistics include

- Weibull function scale and shape parameters
- Mean wind speed
- Energy density
- Uncertainties

In general, the uncertainties decrease with increasing number of wind maps.



Mean wind speed map in the Baltic Sea using up to 239 wind maps in the central part and fewer in the surrounding parts.

Wind-class methodology

The wind-class methodology is based on *a priori* information of the wind statistics from a local mast or other sources, and using that for a representative selection of images as well as for weighting of wind maps in the statistical calculation.

Large-scale mapping

Other types of microwave satellite images may be used for large-scale mapping of ocean wind resources.

Further information

The satellite-based wind resource mapping is offered as a service from Risø DTU.

For further information please email Charlotte Bay Hasager at cbha@risoe.dtu.dk

Risø DTU
Wind Energy Division
P.O. Box 49, VEA-118
DK-4000 Roskilde
Denmark

Phone +45 4677 5097
Fax +45 4677 5970
wasp@risoe.dk
www.wasp.dk
www.windatlas.dk
www.risoe.dtu.dk

Visiting address
Frederiksborgvej 399
Roskilde • Denmark