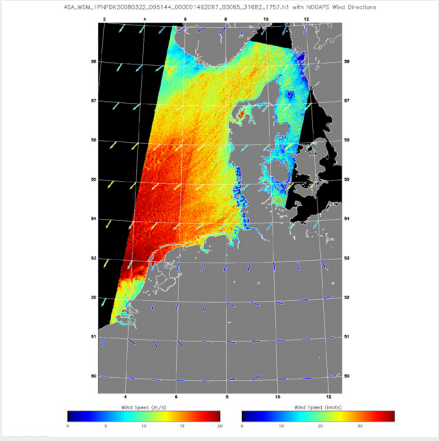
Satellite-based offshore wind resource map

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

Satellite images
Satellite images from the European Space Agency (ESA) are retrieved from Envisat ASAR archive. The radar images were collected day and night and through clouds and rain, thus coverage is made at every pass between year 2002 and 2012. 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.



Wind speed map covering part of the North Sea based on Envisat ASAR from 22 March 2008 at 09:51 UTC. The arrows show winds from the U. S. Navy Operational Global Atmospheric Prediction System (NOGAPS).

Using the near-real-time wind mapping software of the Johns Hopkins University Applied Physics Laboratory (JHU/APL) ocean wind maps are produced.

Wind resource map
Each ocean wind map is georeferenced. 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 scale and shape parameters
- Mean wind speed
- Energy density
- Uncertainties

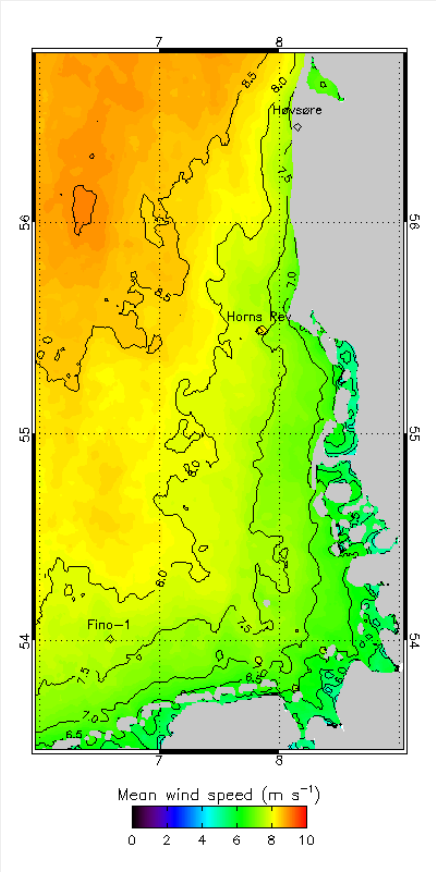
In general, the uncertainties decrease with increasing number of wind maps.

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

Hub-height
We combining satellite wind maps and mesoscale modeling to produce hub-height offshore wind resource maps.

Further information
The satellite-based wind resource mapping is offered as a service from DTU Wind Energy.

Please, contact Charlotte Hasager at email cbha@dtu.dk



Mean wind speed map at 10 m height based on satellite SAR from Envisat for the eastern part of the North Sea.

DTU Wind Energy
Department of Wind Energy

Risø Campus
Frederiksborgvej 399, P.O. Box 49, Build. 118
DK-4000 Roskilde, Denmark
www.vindenergi.dtu.dk