Off-shore Wind Atlas of the Central Aegean Sea: A simple comparison of NCEP/NCAR RE-analysis data, QuickSCAT and ENVISAT Synthetic Aperture Radar (SAR) by use of Wind Atlas Method

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Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

PO. ID 144

Off shore Wind Atlas of Aegean Sea

A simple comparison of RE-analysis data, QuickSCAT and SAR

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DTU

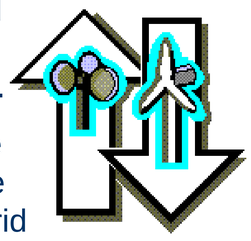
Abstract

Offshore wind energy is progressing rapidly in many parts of the world. Among them, the Aegean Sea is a unique area. Until now, several offshore locations (e.g. North Sea [1], Baltic Sea [2]) have been investigated by means of a new technique based on ENVISAT Synthetic Aperture Radar (SAR) data.

In the current study we try to investigate the positive and the negative sides of SAR results at the Central Aegean Sea and compare with two other parallel developing techniques; NCEP/NCAR re-analysis based Ocean wind Atlas scatterometer winds QuickSCAT [3]. WAsP software and/or method is used in all steps of the study.

Method

Our final goal with our data sources was to create wind atlases to generate resource grids for certain areas. The subject in a 'wind atlas' is a systematic and comprehensive collection of regional wind climates (RWC) derived by the wind atlas methodology [4].



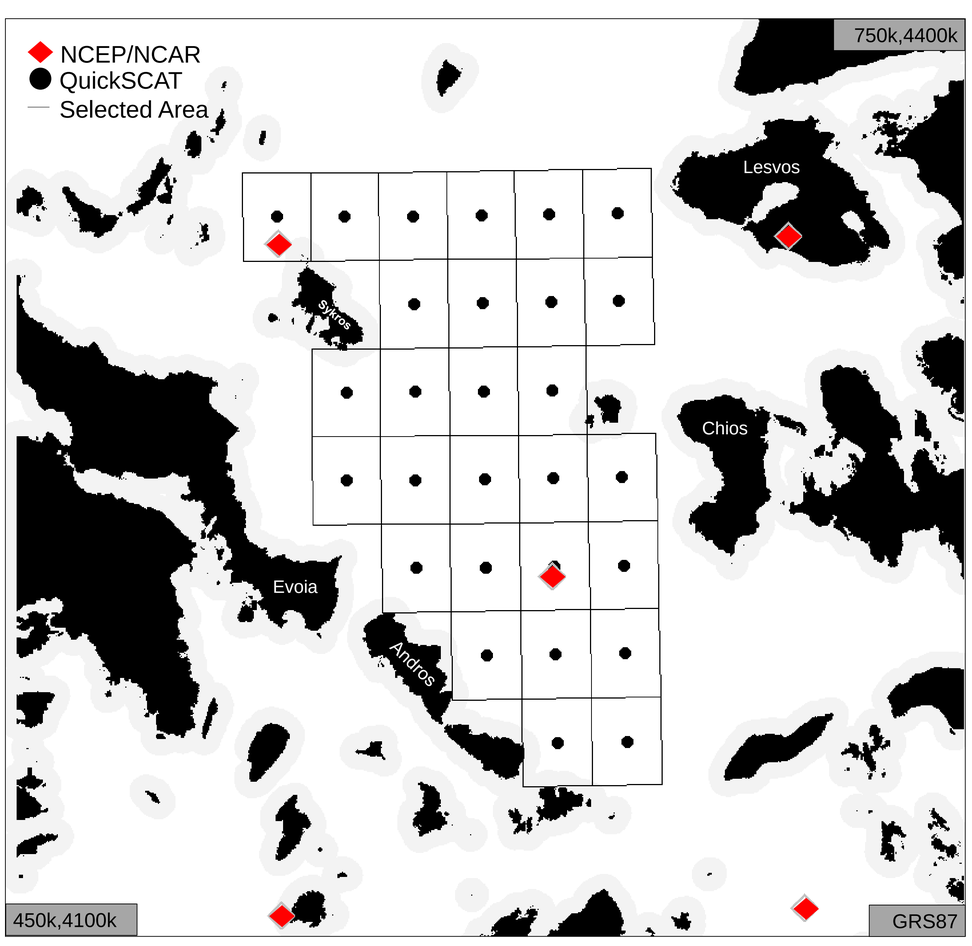
Standard wind resource grid calculations are made by using the three different data sets and these datasets are described in the Data Sources section. All applied steps to reach the resource grid are available in the conference proceedings.

Data Sources

NCEP/NCAR : Re-analysis data for the period of 1971 to 2001 is used. The data has approximately 2º resolution and it consists of 6-hourly model results. Therefore each wind atlas is a product of nearly 60000 samples. Wind Atlases at 4 locations in Central Aegean sea are chosen for the selected area.

QuickSCAT: With a daily global coverage of more than 90% of the world's oceans, QuickSCAT provides a valuable dataset with more than 10 years, between 1999 and 2009, of two daily observations at 10m a.s.l. Data are available at a 0.25º grid. After the source data is filtered for rain, the grid points of the selected area include almost 5000 valid wind speed and wind direction measurements during the 10 years of measurement [3].

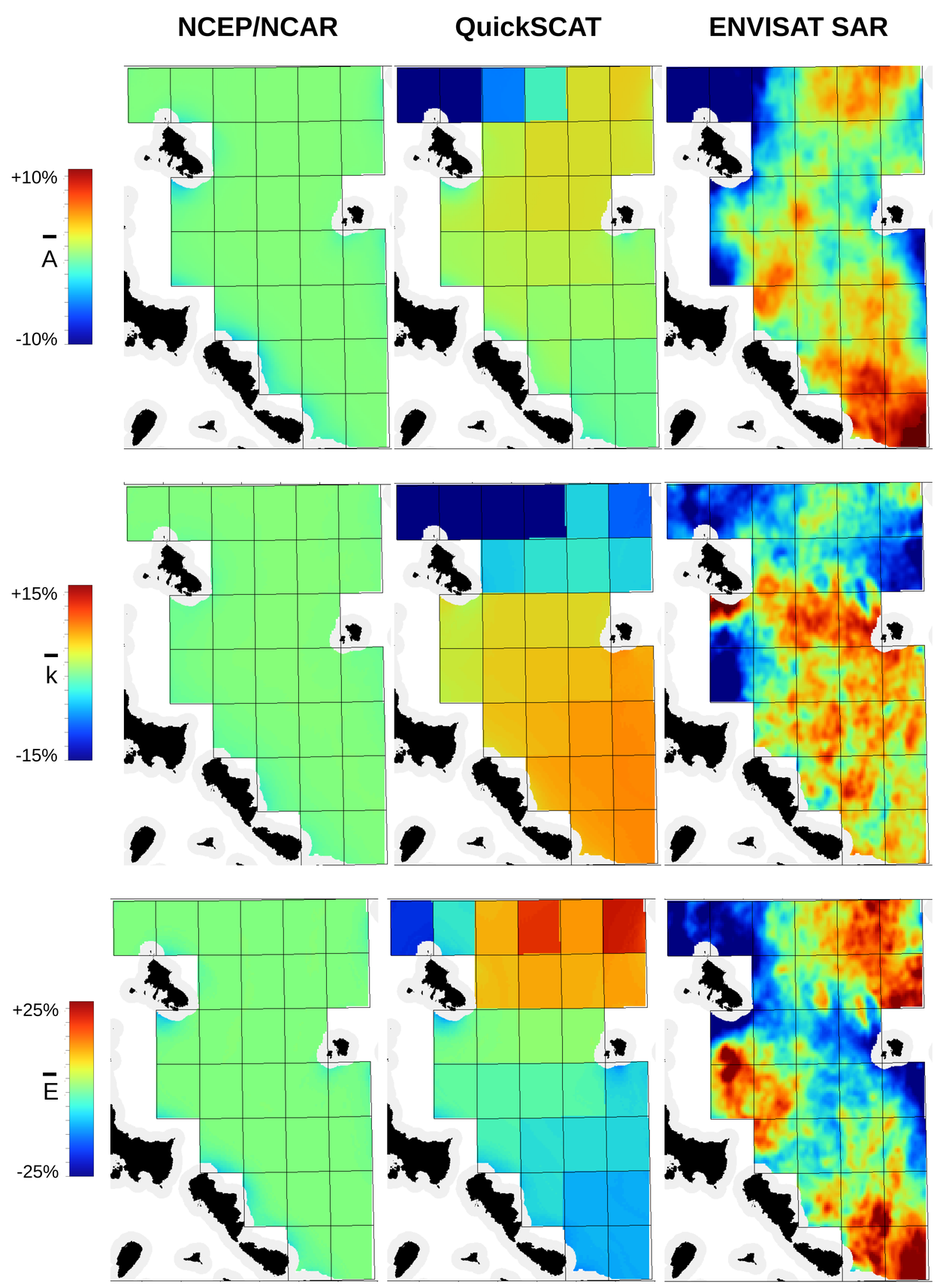
ENVISAT SAR: The mission is running since 2001, where high resolution wind fields can be measured at 10m height a.s.l. DTU Wind Energy processes several SAR images a day. The Central Aegean dataset currently includes 500 ENVISAT ASAR WMS scenes from March 2010 and March 2012.SAR data has been used in several other places where in-situ measurement comparisons were available. [1,2].



Results

NCEP/NCAR derived ocean wind atlas captures only large-scale flow features. Flow features due to meso-scale phenomena are missing. This area provides a test bench for evaluating other wind atlas products derived from alternative reanalysis data set. This will an important element to the evaluation of the global wind atlas project.

QuickSCAT has a higher than NCEP/NCAR and lower than ENVISAT SAR spatial detail. The averaging inherent in the wind retrieval process of QuickSCAT and NCEP/NCAR eliminates the small scale features seen by SAR.



Conclusion

One can rapidly calculate the wind resource map of an offshore location including statistical parameters by using the WAsP based tools we have created for different type of data sources.

A shortcoming of this study is the lack of validation with in-situ measurements which would greatly improve the usage of the datasets. It is intended that several on-shore and off-shore calculations are used in further steps of this study.

Nevertheless, obtained knowledge can be used to locate possible offshore masts for future campaigns, especially when the SAR results are used.

References

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Acknowledgements

- NCEP/NCAR reanalysis data are provided by the National (USA) Center for Environmental Prediction (NCEP) and the National (USA) Center for Atmospheric Research (NCAR).
- QuickScat data are produced by Remote Sensing Systems and sponsored by the NASA Ocean Vector Winds Science Team. Data are available at www.remss.com.