Co-designing satellite wind products for offshore wind energy

Badger, Merete; Karagali, Ioanna; Cavar, Dalibor; Owda, Abdalmenem; Hasager, Charlotte Bay

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Co-designing satellite wind products for offshore wind energy

M. Badger[1], I. Karagali[2], D. Cavar[1], A. Owda[1], C. Hasager[1]

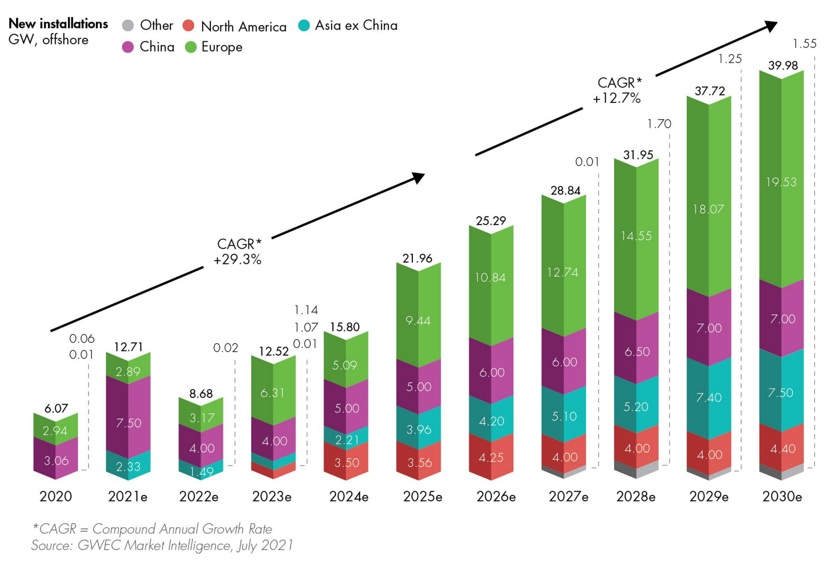
[1] Technical University of Denmark, [2] Danish Meteorological Institute

DTU

e-shape

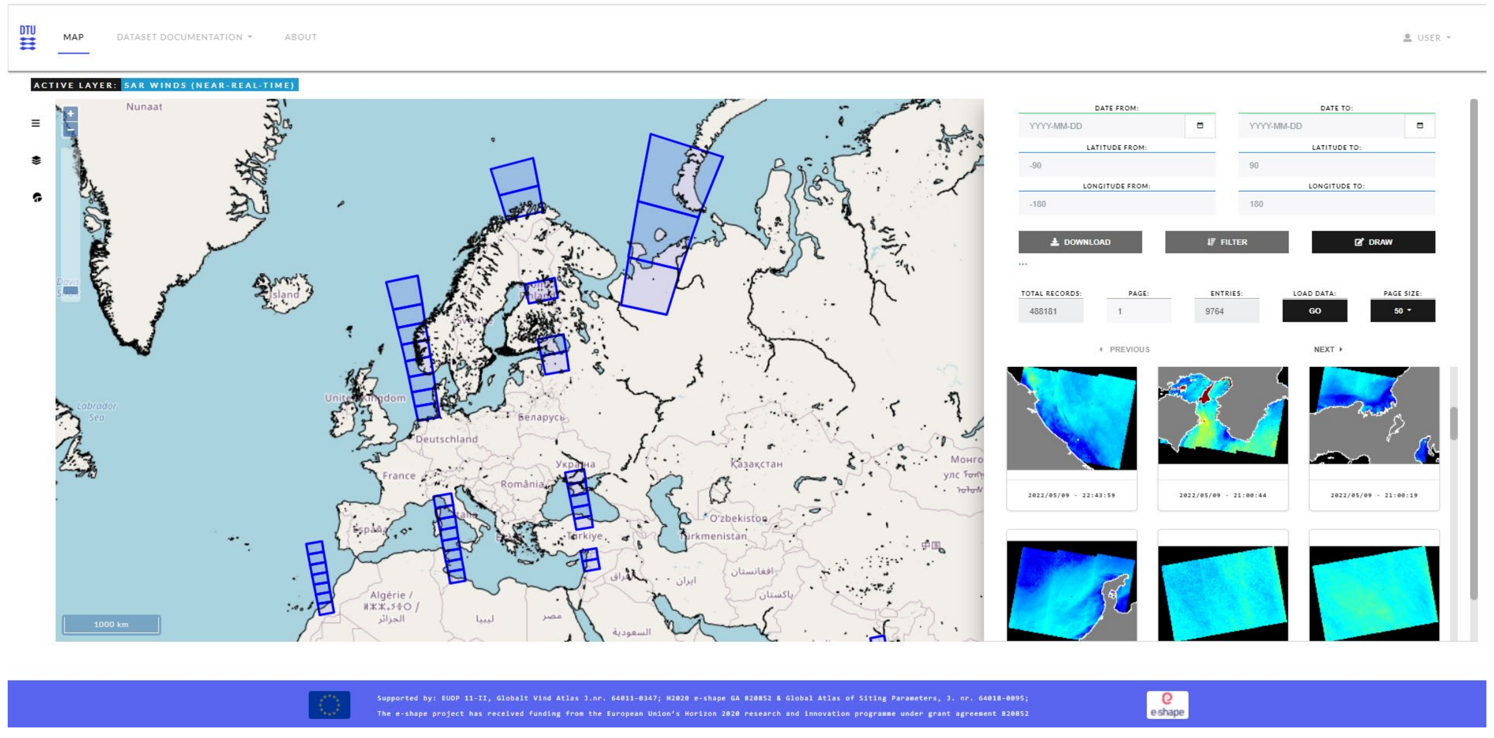
Introduction

The world's first large-scale offshore wind farm was installed at Horns Rev in the North Sea in 2002 – twenty years ago. Since then, the offshore wind energy sector has grown immensely to become a global business, which plays a major role for the green energy transition. The global offshore wind energy capacity was 35 GW in 2020 and offshore wind is considered to have the biggest growth potential of any renewable energy technology[a]. Wind turbines are getting bigger and bigger in terms of capacity, height, and blade size and new technologies are currently emerging such as floating offshore wind turbines.



Forecast of new offshore wind energy installations and the most important markets in the world[a].

Since observations of met-ocean parameters offshore are sparse, the wind energy industry relies largely on atmospheric modeling and short measurements campaigns for the planning of future wind energy projects. The use of EO data sets and derived variables is not yet widespread in this community and the learning curve for exploiting such data sets remains steep.



DTU's EO-based web service for offshore wind: https://science.globalwindatlas.info

EO-based services for offshore wind energy

Maps showing instantaneous wind fields retrieved from Sentinel-1 and Envisat SAR imagery are available through the Global Wind Atlas Science Portal by DTU. Users can browse and download the maps though this web interface and view derived products such as wind resource maps over the European seas[b].

Co-designing with the users

As part of the H2020 project e-shape, researchers from DTU have established co-design cycles with users from the wind energy industry. The objective is to better understand the industry views upon the usefulness and the usability of EO-based data sets – primarily wind maps retrieved from SAR and scatterometers and combinations of the two. Three user representatives were interviewed and confronted with a prototype of our EO-based service:

C2WIND equinor VORTEX

User feedback

Feedback gained from user interviews has been structured and the following crosscutting requirements have been identified:

- Easy-to-read documentation of the EO-based data sets is needed e.g. a blog, explainers, and illustrative examples.
- EO-based parameters should come with quality flags e.g. indicators of bright targets, bathymetry effects, and atmospheric stability conditions.
- User-defined time series for specific points should be easy to extract in standardized formats - to be used in combination with other wind data sets.
- Co-located wind and wave height information is desired; especially for floating offshore wind energy.

A 'resilient fit' approach to co-design

Co-design actions in e-shape are designed to establish a 'resilient fit' by generating a range of alternatives rather than a 'quick fix' (regarding the lists of requirements, the stakeholders involved, the types of partnerships). This is for a better adaptation to future surprises[c].

References

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c. Barbier, R., Yahia, S. B., Le Masson, P., & Weil, B. (2021). Expanding Usages of Earth Observation Data: A CO-Design Approach to Grow an Ecosystem of Efficient Service Designers. 2021 Ieee International Geoscience and Remote Sensing Symposium Igarss, 296–299. https://doi.org/10.1109/IGARSS47720.2021.9553914.

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