4567

Detecting effects on migratory birds:

how the application of multistatic radar could help close remaining knowledge gaps

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Bird Migration / Monitoring / Radar / Offshore wind farms

Background

Ornithological research conducted so far within the RAVE research initiative has provided valuable basic knowledge about behavioural responses of migratory birds to offshore wind farms. Results showed that responses were highly species specific and influenced by existing environmental conditions.
However, as technical limitations still hinder the continuous monitoring of flight paths within the wind farm area independent of weather, time of day and species diversity, knowledge gaps regarding evasive behaviour and collision risk remain, particularly during periods of darkness and adverse weather. Since the majority of birds migrate at night and risk of collision is high during adverse weather, there is a significant need for integrative monitoring methods. With the future expansion of wind farms, there is an increasing need for innovative methods which address advances in the scalability of an observed area, automated analysis of data and evaluation of cumulative effects.

Approach

In a collaborative effort, a radar-based concept is currently being developed to determine options of multistatic applications for assessing the potential threat to migratory birds. The project is divided into two parts:

I. Definition of specific requirements & functions to be met by the system
II. Concept Development

I. Method

First, the following analyses were carried out:

- Radar cross section (RCS) and biometric data of relevant bird species
- Scope of coverage
- Wind farm related conditions
- System configuration of existing radars

Consequently, the identified requirements and functions were prioritised and evaluated with relevant stakeholder during a workshop.

I. Results

A) Project Objective
- Registration of flight paths of small birds during nighttime and adverse weather in 3D

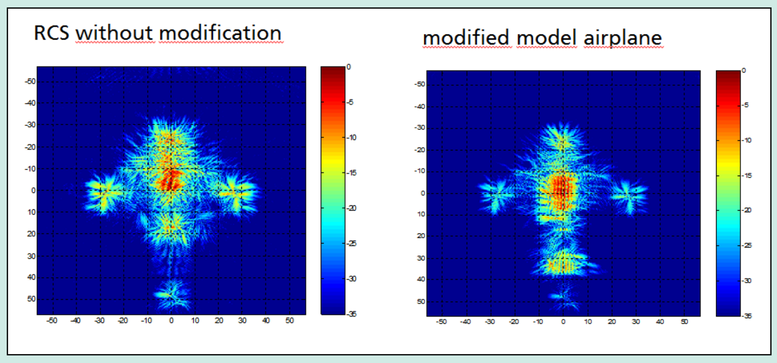
B) Measuring performance / scope of coverage
- Ocean Surface – 300 m (Rotor swept zone)
- Up to 10 km away
- Complete coverage within a wind farm

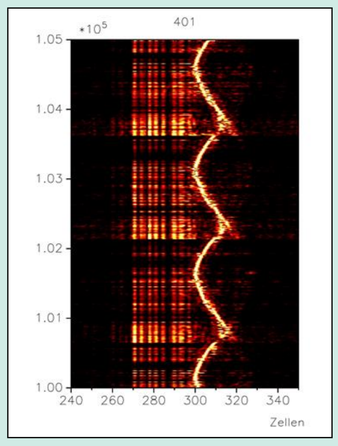
C) Infrastructural requirements
- Deployment at the rail of the platform
- Remote access
- H&S
- Technical integration

II. Concept Development

The defined performance parameters are currently linked with analyses and calculations to identify the specific technical characteristics of a multistatic system and its practicality for monitoring flight paths within wind farm areas. A guideline for implementation including the necessary scientific and technical intermediate steps for validation will be drafted, thus reducing risks in development and enhancing chances for successful project realization. Experimental field measurements will be carried out to verify basic assumptions of bird detection made during the conceptual phase.

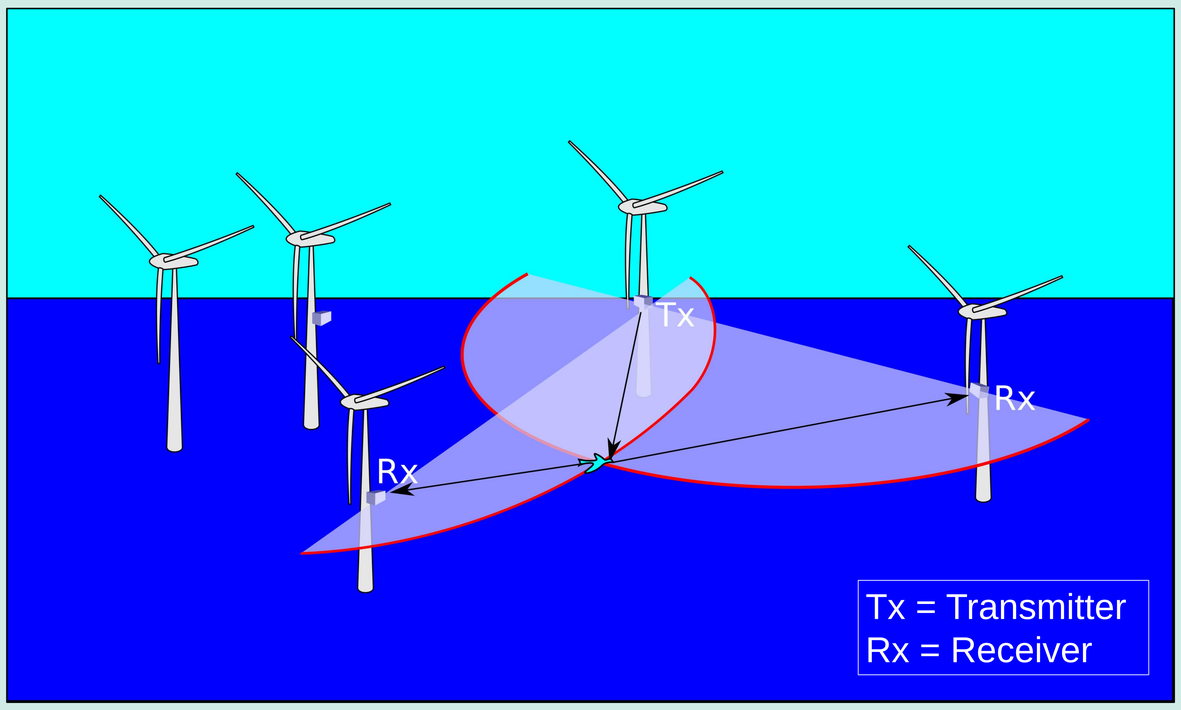
II. Analyses / Calculations





- Experiments in measuring chamber – model airplane
- Analysis of wind turbine rotor echo

Multistatic Approach



- Track while scan
- Rx sensors much cheaper than Tx
- Flexible scalability

Outlook

OASE I – Concept

OASE II
- Demonstrator
- On- / Offshore Tests

OASE III – Wind farm Deployment

Further technological development of bird monitoring methods will improve the basis for assessing and predicting environmental impacts of wind energy on migratory birds. Consequently, a more robust data basis will provide governmental authorities and industry representatives with the information needed to improve planning, approval and mitigation processes.

Acknowledgements / Literature

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