Offshore Wind Measurement Using Lidars on Ships

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Overview





What is a Wind Lidar?

- Lidar = acronym of **Laser Imaging, Detection, And Ranging**
- Laser beam illuminates the moving parcel in the air
- Motion of the target along the beam direction leads to a change in the light's frequency via the Doppler shift
- Measuring Frequency Change leads to Wind Speed Measurement

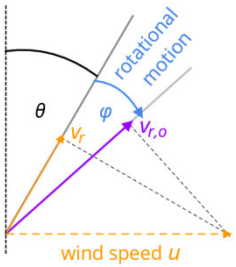
Employment of Wind Lidars in Offshore Wind Farms

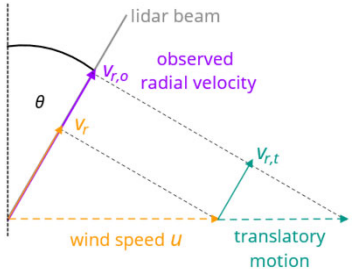
- Nacelle based
- Fixed platform
- Floating (buoy or Ship based)

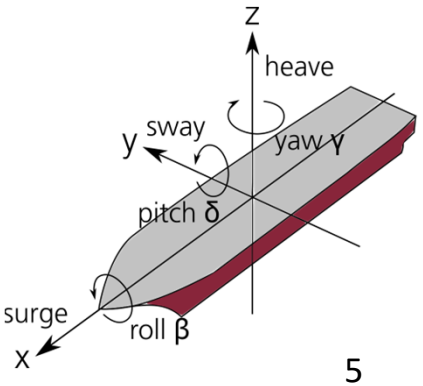
Sunrise in Rødsand-II– September 2022

What are the Pros and Cons of Ship based Lidars?

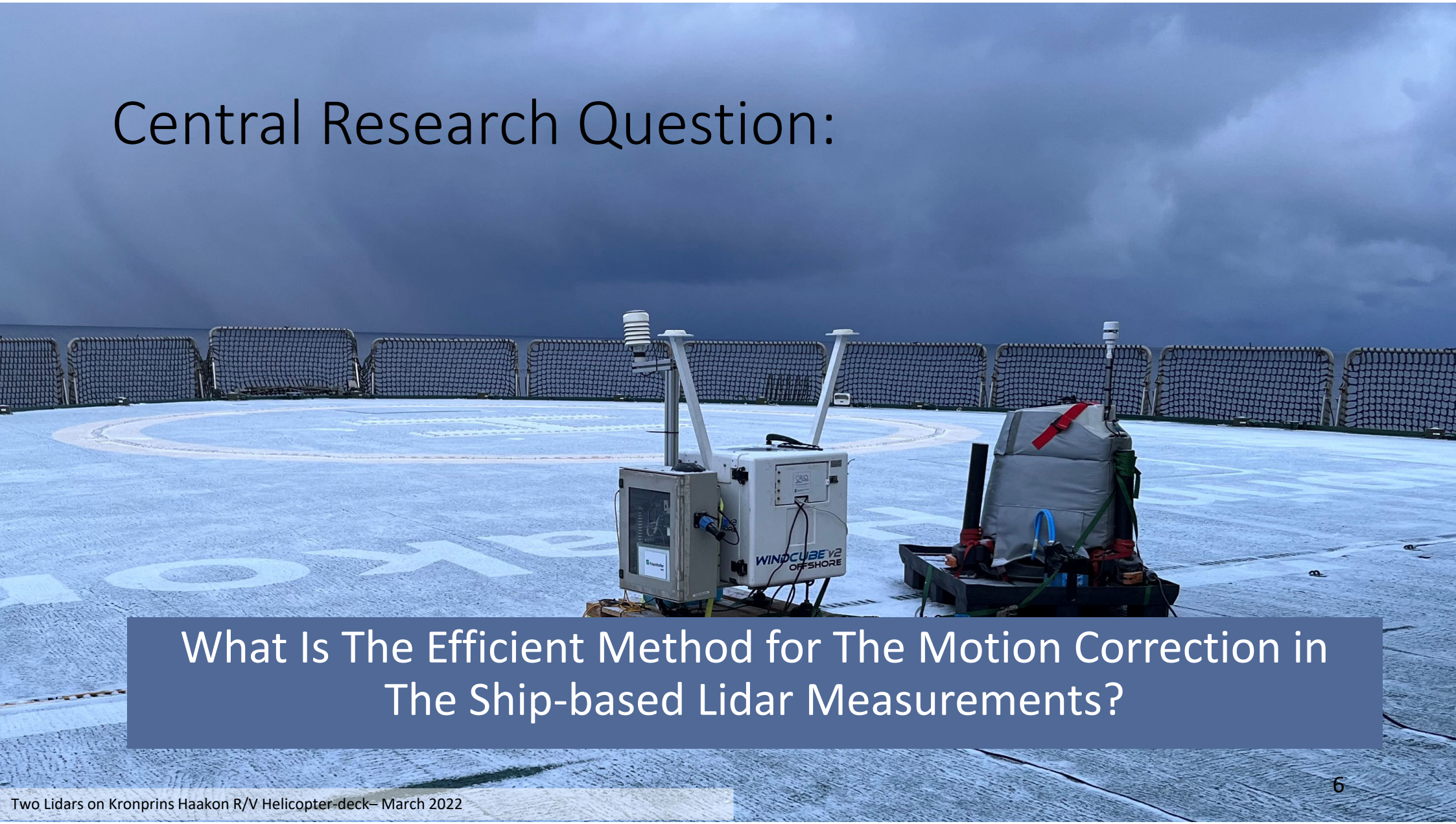
- Easier access / maintenance
- Capable to provide reliable wind data over large area
- Not limited by depth of water
- Motion of ship induces errors on the lidar wind measurements







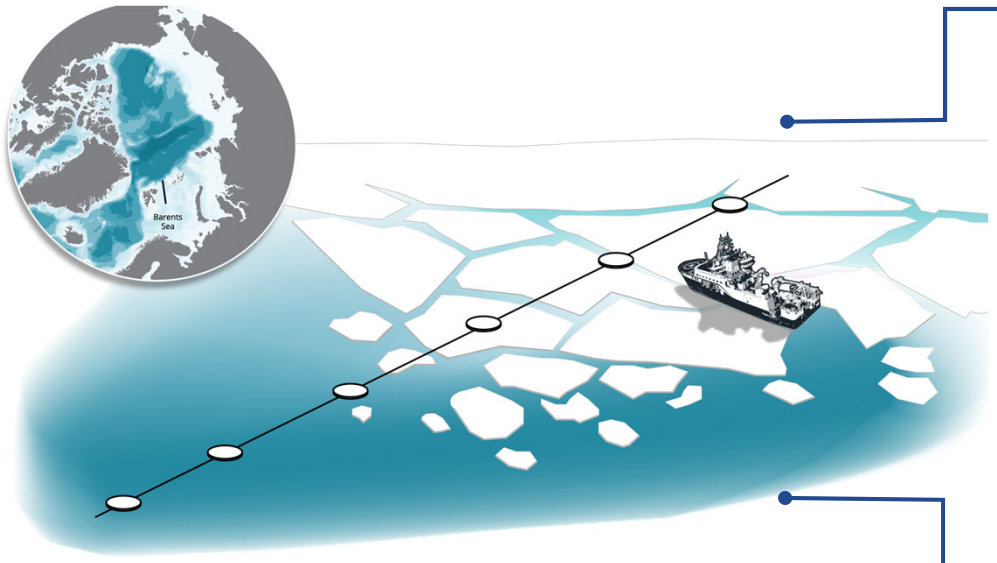
Central Research Question:



What Is The Efficient Method for The Motion Correction in The Ship-based Lidar Measurements?

Two Lidars on Kronprins Haakon R/V Helicopter-deck– March 2022

Required Measurement Campaigns



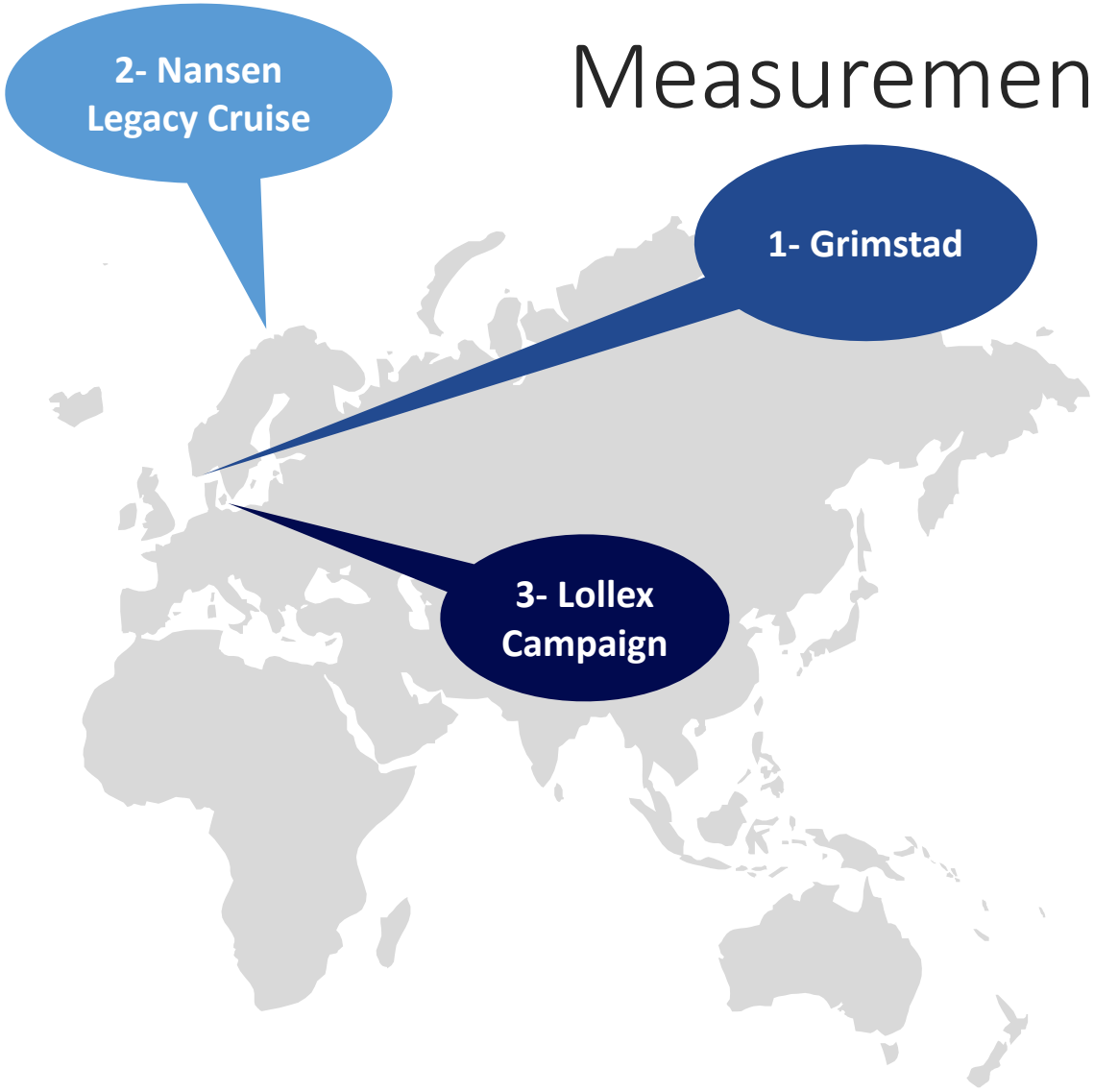
Controlled Motion Experiment

Goal: systematic investigation of the motion induced uncertainties on lidar measurements

Real Motion Measurements

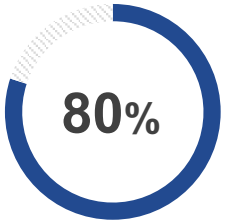
Goal: investigation of the real motion induced uncertainties on lidar measurements

Measurement Campaigns



Grimstad
Grimstad-Norway-2011

Data Collection and data analysis finished



Nansen Legacy Cruise
Barents Sea-Norway-2022

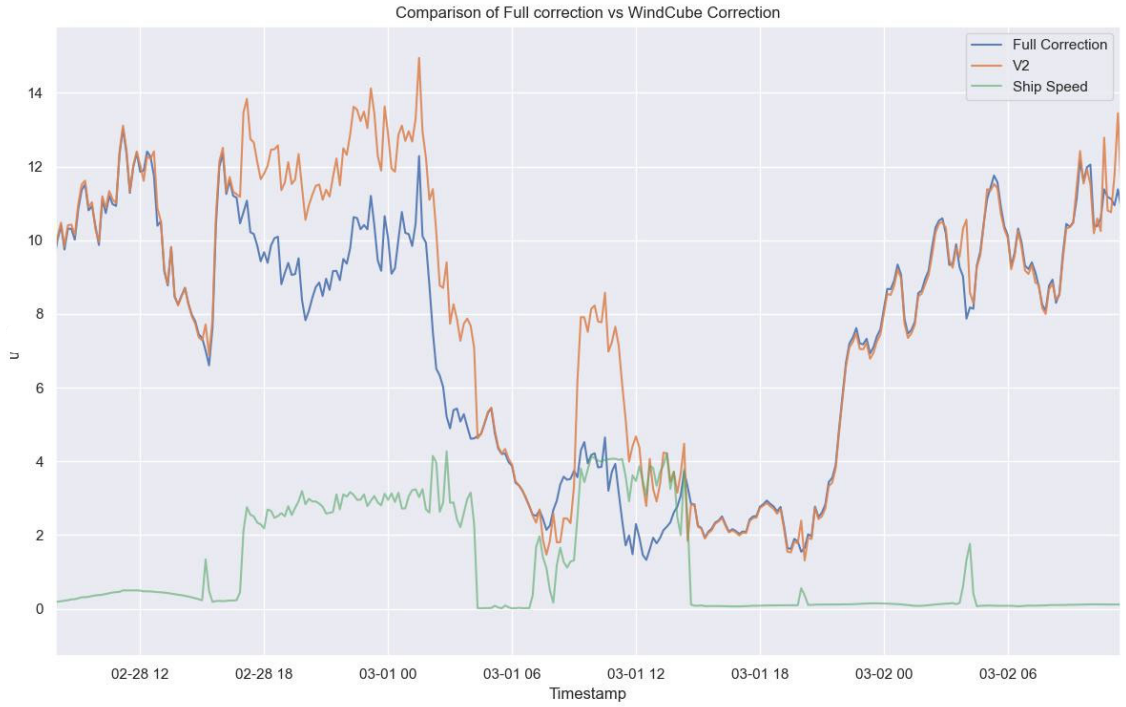
Data Collection had finished
Data analysis ongoing

Lollex Campaign
Rødsand-II Wind Farm
Denmrak- Ongoing

Data Collection ongoing

One Example: Motion Correction Nansen Legacy Cruise

- Full Correction of Translatory and Rotational motion
- WindCube V2 internal motion Correction for rotational motion
- WindCube V2 is not capable of correcting translatory motions
- Development of full motion correction is necessary



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- **RWE Wind Services Denmark A/S**

Reference

JC3 Winter gaps cruise: Cruise Report (https://doi.org/10.7557/nlrs.6685)