Measurement of wind profile with a buoy mounted lidar

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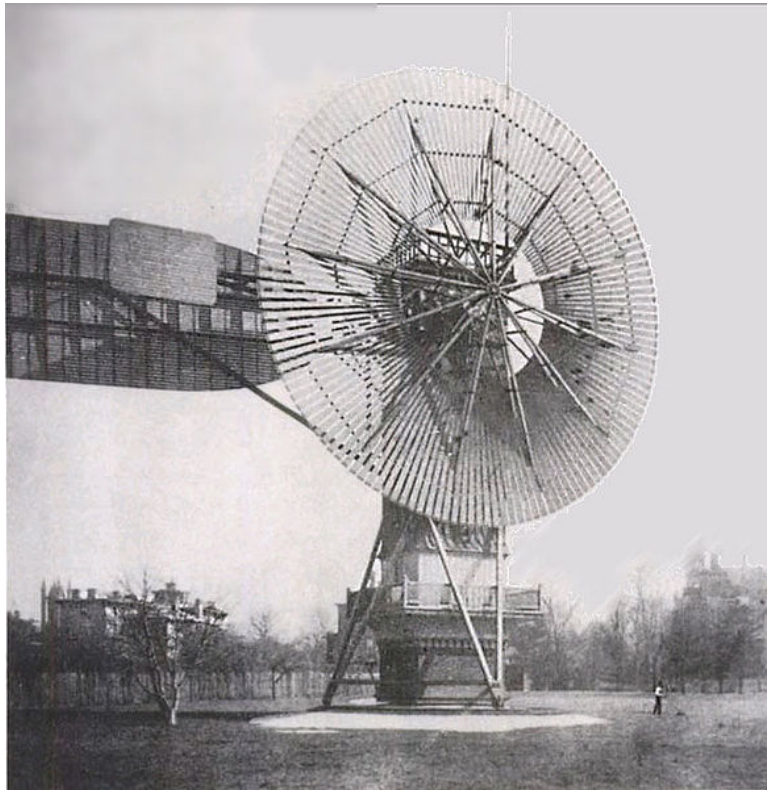
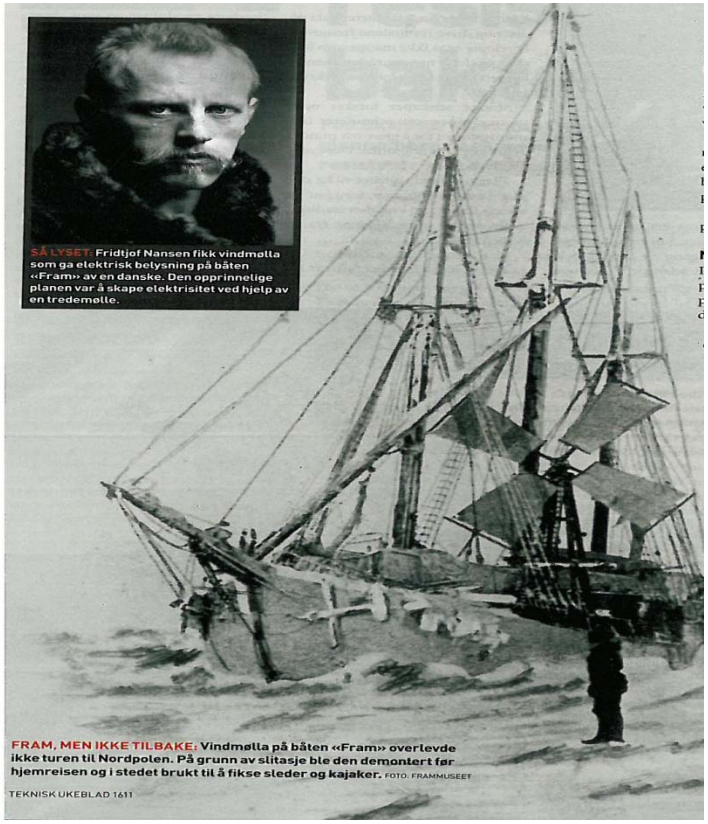
History

First Automatic Wind Turbine

1887 Maykirk Scotland



First Norwegian Wind Mill at Fram



Partisipants

Fugro OCEANOR

University of Bergen

Christian Michelsen Research

Statoil

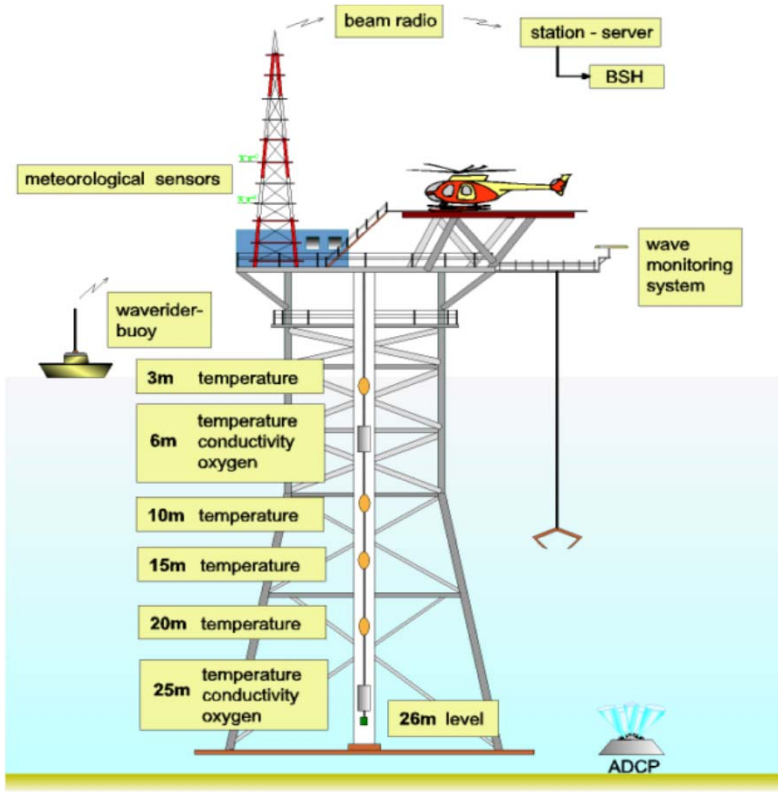
Marintek

Project tasks

- Formulation of requirement and specification of the system
- Concept study
- Development of a prototype including hydrodynamic simulations
- Development of a compensation algorithm for the buoy motion
- Building of a prototype buoy
- Field test of the buoy

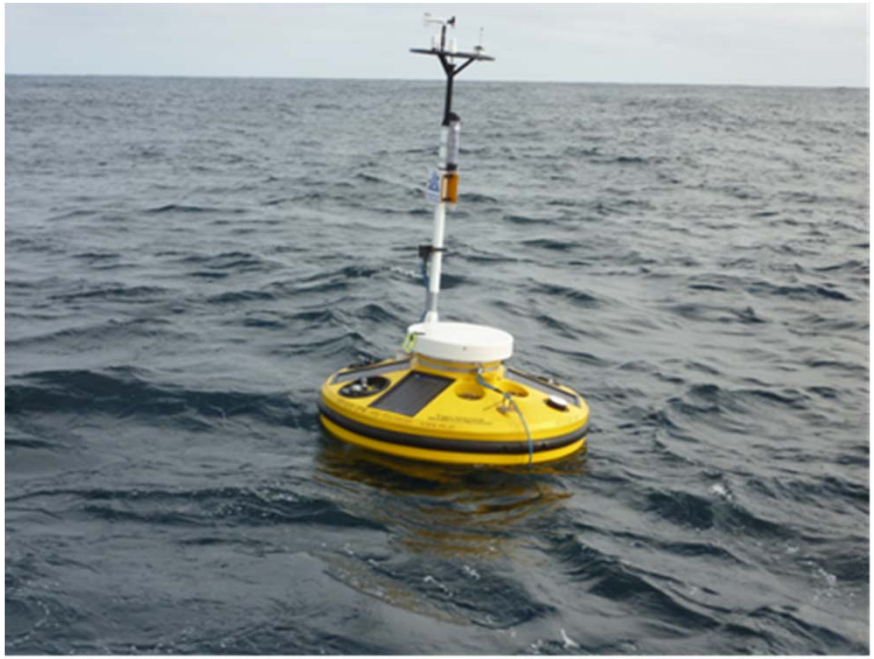
Present technology

FINO1 German Bight



Price NOK 50 mil

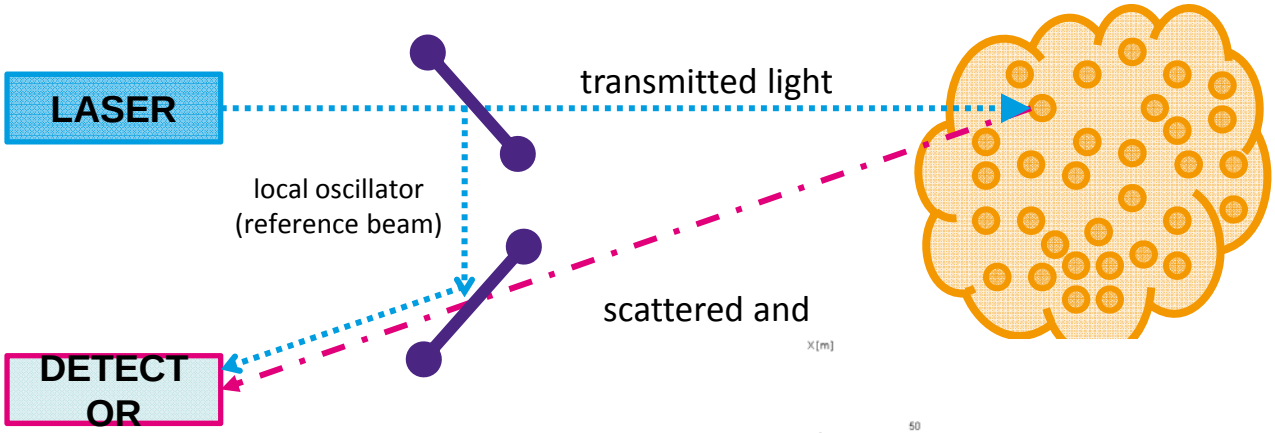
Measurement system

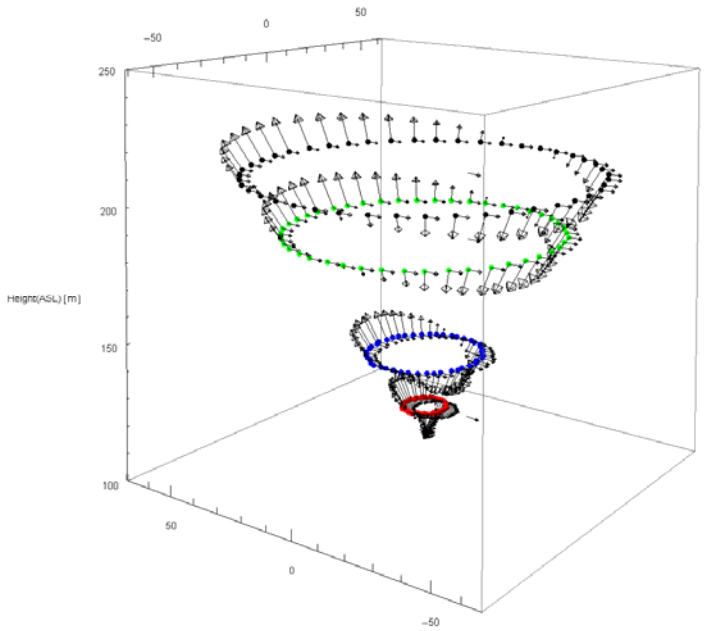


Wavescan buoy

ZephIR 300 lidar

ZephIR 300 lidar from Natural Power





Principles of operation:

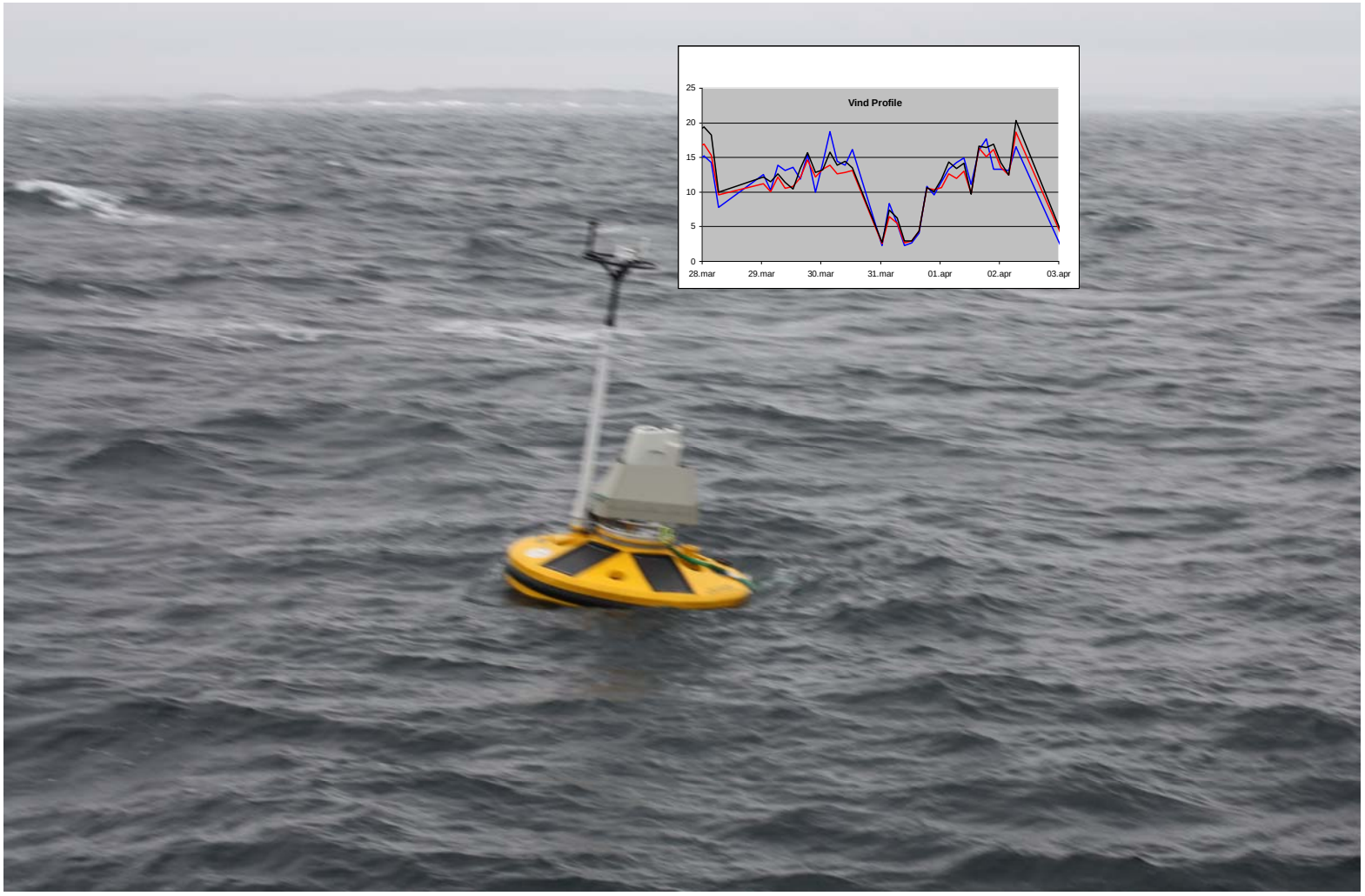
- Laser radiation scatters from atmospheric aerosols
- A laser is focussed at a point incident with the aerosols
- Aerosols movement follows the wind
- Scattered radiation is ‘Doppler’ shifted by the wind speed
- The ‘in-line’ component of wind speed is measured

Benefits of the SEAWATCH Wind Lidar Buoy

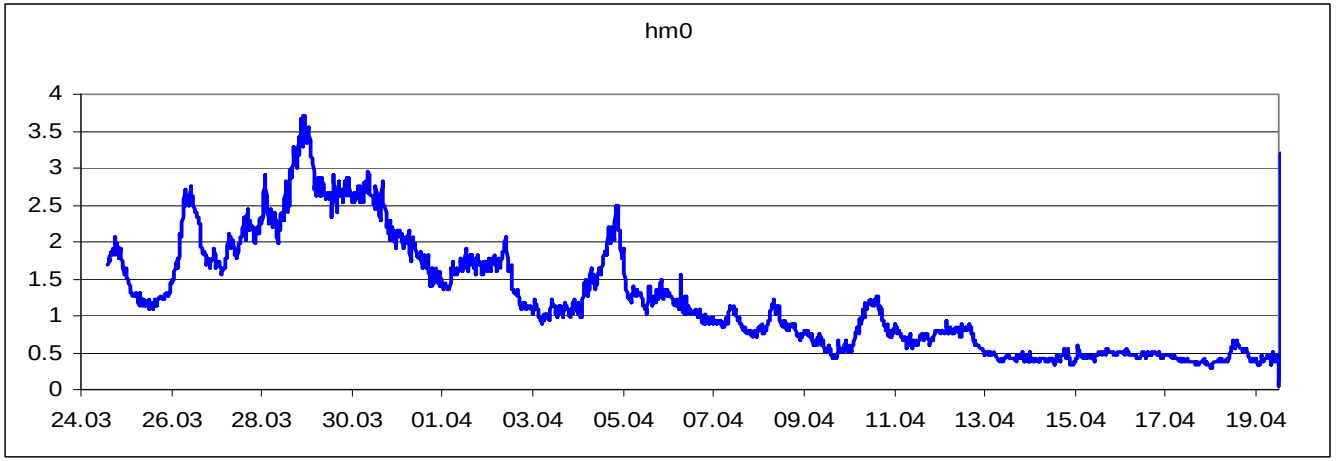
- Wind profile, meteorological parameters, waves, current profile and other parameters can be measured from one single buoy
- The ZephIR can measure wind at 10m which is according to the WMO standard
- No recalibration is required for the ZephIR
- The Wavescan buoy is lightweight and small and is therefore easy to deploy and recover from vessels
- A standard single point mooring system is used

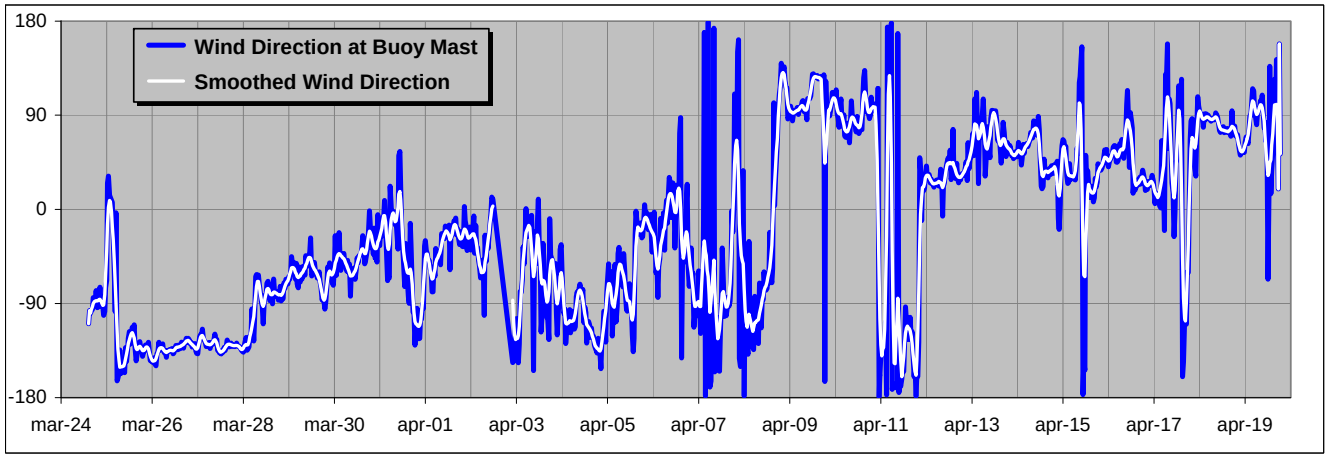
Test location Titran

Testing of Lidar buoy off the wind test centre

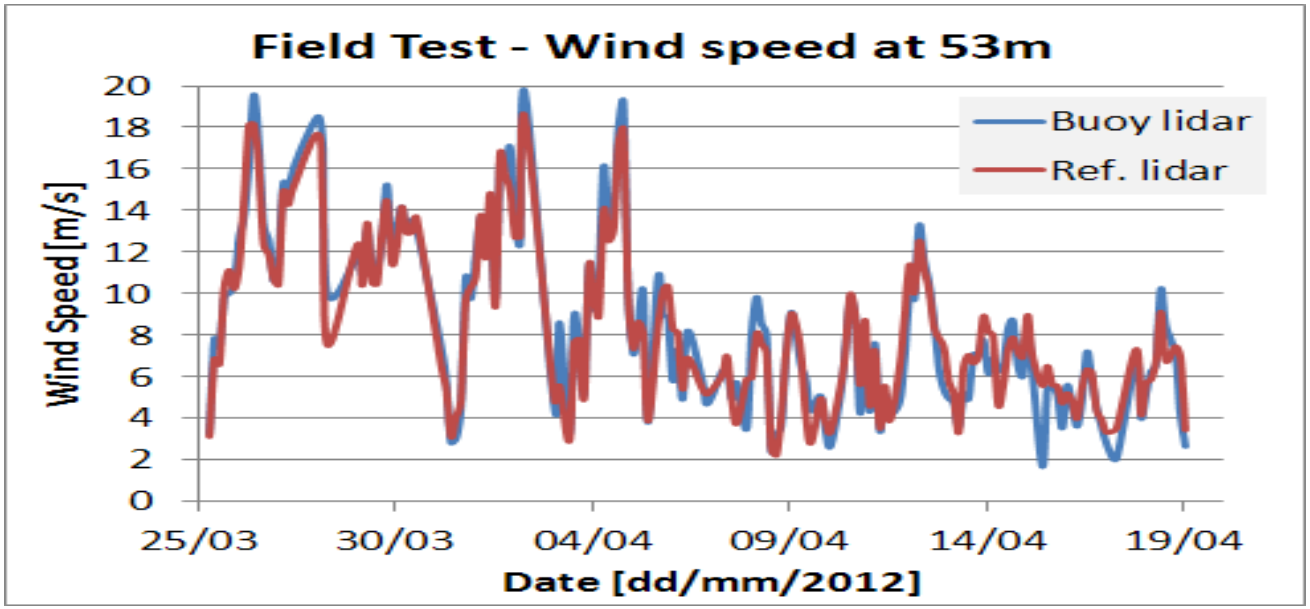


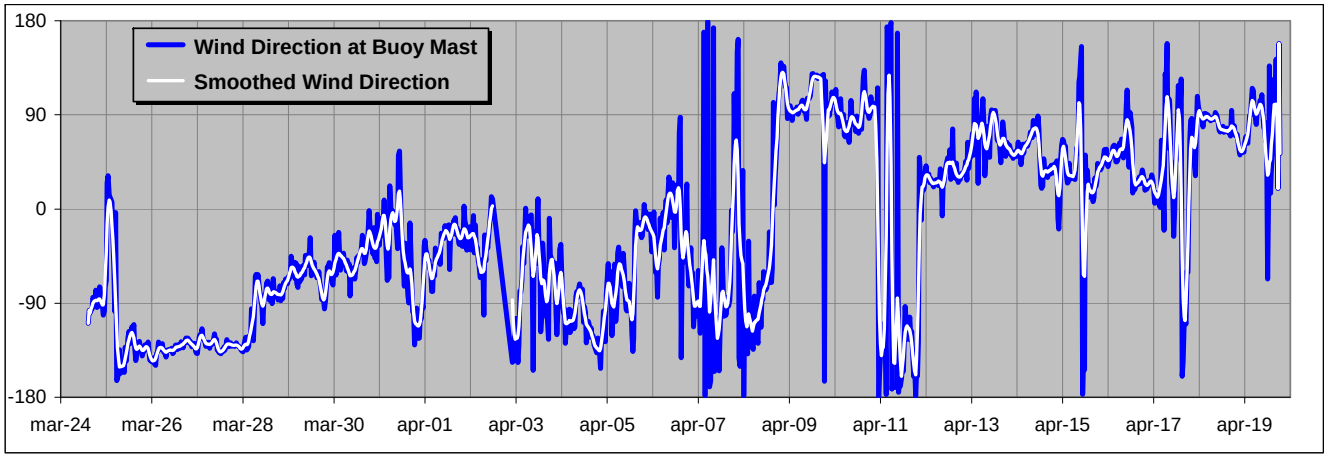
Preliminary results without compensation



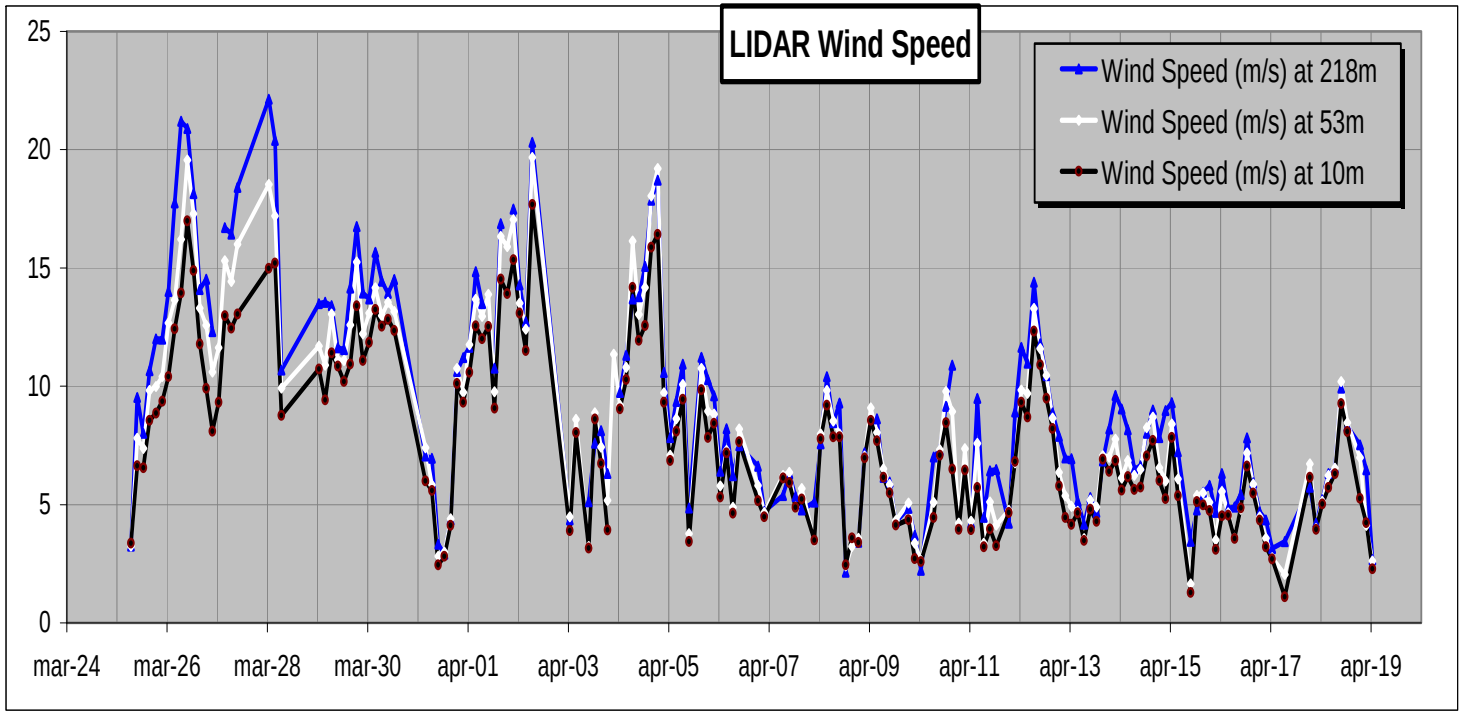


Wind speed and direction



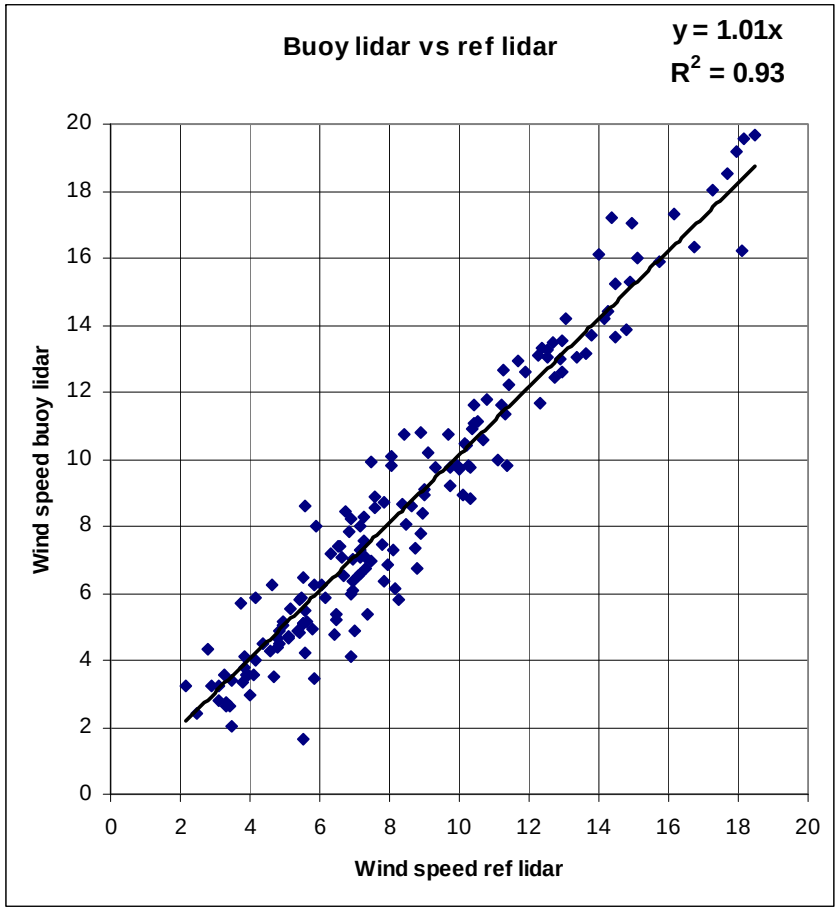


Wind speed for different heights

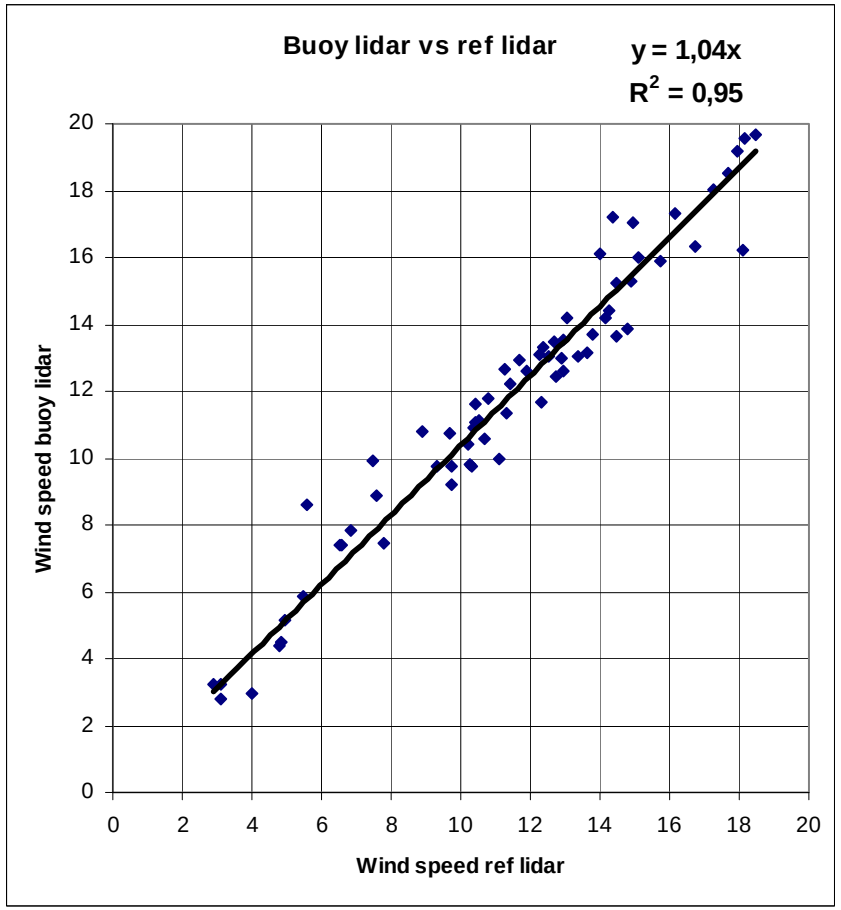


Scatter plott

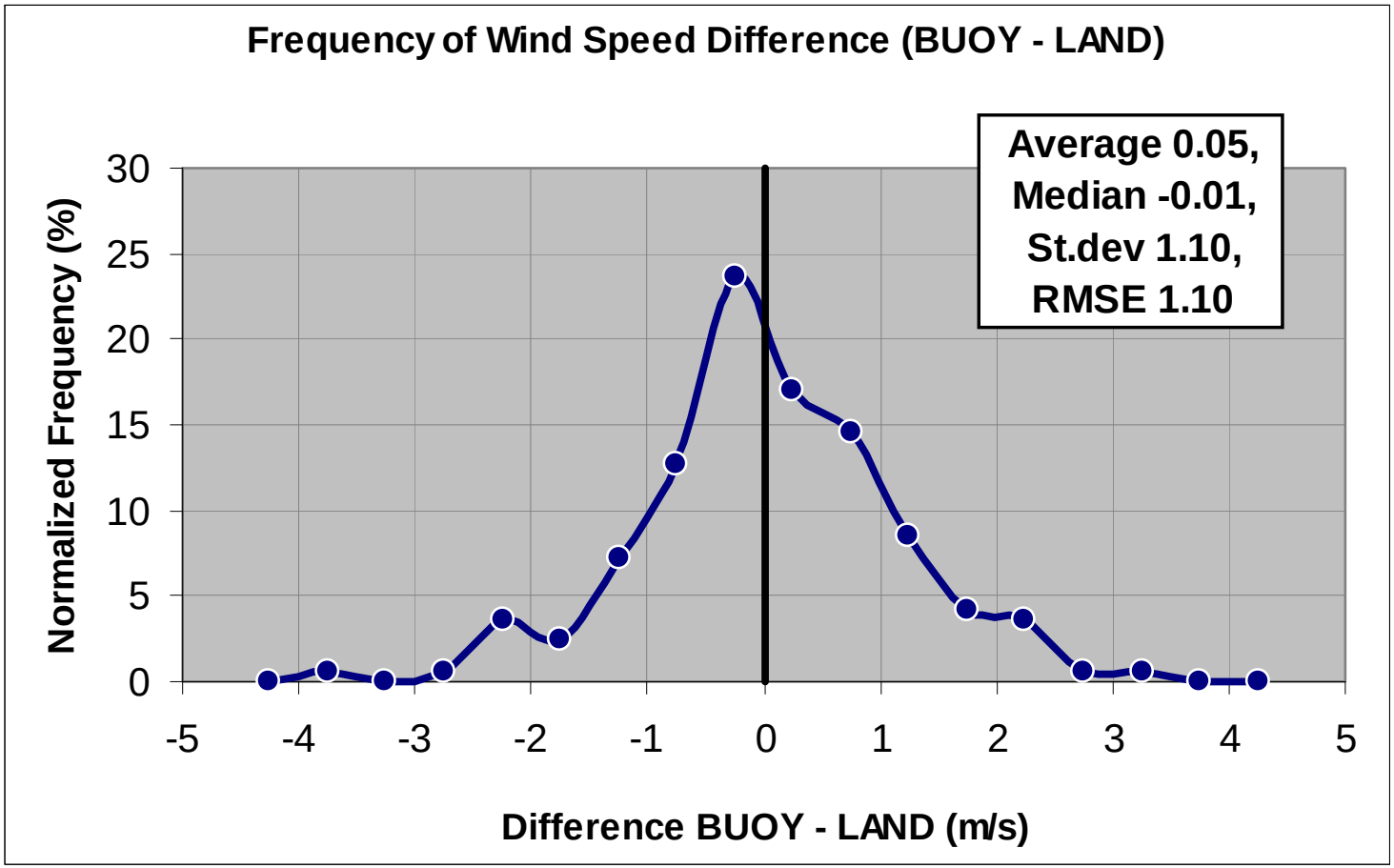
All data



Strong wind (before 5th April)



Frequency distribution



Further work

- Comparing the buoy lidar data with the wind sensors at the met mast
- Include fuel cells for powering of Lidar
  - Methanol cartridges to be located in wells below the solar panels
  - Consuming 2 litres of methanol per day
  - 8 carriages from EFOY: Operational time 112 days
  - 4 special designed cartridges: Operational time 180 days
- Interfacing Geni to the Lidar
- Include compensation software in Geni
- Include “slam” Lidar
- Interfacing with the small scale wind model at Kjeller Vindteknikk

Move

Fuel cell from EFOY

SEAWATCH Wind Lidar Buoy