The OBLO infrastructure project

Measurement capabilities for offshore wind energy research in Norway

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Extensive measurement campaigns are carried out in order to assess the wind potential at offshore wind farm sites, both before and after the erection of the wind turbines. The use of state-of-the-art Lidar technology enables researchers and wind farm operators to gain valuable information on the wind field and wake effects. To gain a complete understanding of the wind conditions at an offshore wind farm site, Lidar measurements should also be supplemented by measurements of other meteorological and oceanographic parameters, such as air and water temperature, humidity, wave and current speed, and wave height.

The OBLO infrastructure project offers access to state-of-the-art remote measurement capabilities for wind energy applications, as well as supplemental scientific oceanographic instrumentation. The instrumentation is available for public and private research institutions dealing with wind energy in Norway. OBLO also offers services for planning and execution of field deployments and post-processing and quality control of collected data as well as the scientific analysis of the data set. A complete list of available OBLO instrumentation and information regarding infrastructure access can be found at http://oblo.uib.no .

Data visualization

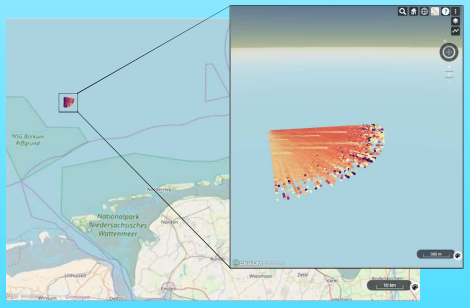
The collection of both Lidar data and additional met-ocean measurements generates large and complex data sets, resulting in time consuming and resource demanding data analysis efforts.

To simplify the planning and execution of measurement campaigns and the subsequent data analysis, NORCE Technology is investigating the potential of:

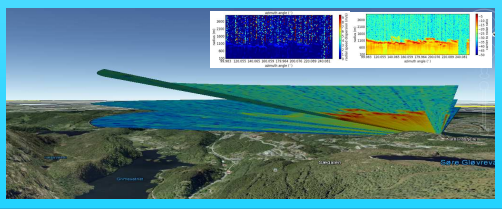
- Standardized methods and user friendly tools for pre- and post-evaluation of uncertainty and validity of Lidar measurements
- Interactive, multivariate data visualization for analysis of complex measurement datasets

A multivariate visualization tools with interactive parameter filtering is highly valuable for e.g.:

- Rapid assessment of early results for quality control of measurement setup
- Simplified evaluation of multi-instrument campaign results
- Evaluating parameter settings versus performance (e.g. CNR thresholds)
- Search for correlation factors



Example of the NORCE Technology in-house developed Enlighten-web computation and visualization tool for analysis of multidimensional data, which can easily visualize large and complex Lidar data sets.



3D visualization of measurements is of high value for analysis of scanning Lidar data, e.g. for wakes and complex terrain

Example Google Earth integration of wind measurement data.

Some of the available instrumentation within OBLO

- 2 x WindCube V1 (vertical wind profiles) [A]
- 1 x ZephIR 300 (vertical or horizontal wind profiles) [B]
- 2 x Passive microwave radiometer (vertical temperature and humidity profiles) [C]
- 1 x WindCube V2 offshore [D]
- 3 x WindCube100s [E]
- 1 x Furgo Wavescan buoy [F]
- 2 x oceanographic bottom frame [G]
- 2 x submerged buoys [H]

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OBLO wind Lidar field deployments

Lidar motion platform test, NORWAY

Investigation of measurement errors when performing Lidar wind measurements from a moving platform.

August 2011

LIMECS at Stavanger airport, NORWAY

Investigating coastal boundary layer flows.

Additionally, validation of Lidar measurements against radio soundings.

March – August 2013

WINTWEX at Wieringermeer, Netherlands

Combining 4 Lidar systems for investigation of wind turbine wakes at the ECN test site.

November 2013 – May 2014

OBLEX-F1 at FINO1, GERMAN North Sea sector

Improving our knowledge of the marine atmospheric boundary-layer stability, turbulence generation processes and wind turbine wake propagation effects close to the Alpha Ventus wind farm.

June 2015 – October 2016

COTUR at Obrestad Lighthouse, Norway

Improving our knowledge regarding offshore wind turbulence and horizontal coherence, with respect to offshore wind energy.

Starting from January 2019