M.Sc. Thesis: Verification of the implementation of lidar measured wind fields in a wind turbine simulation

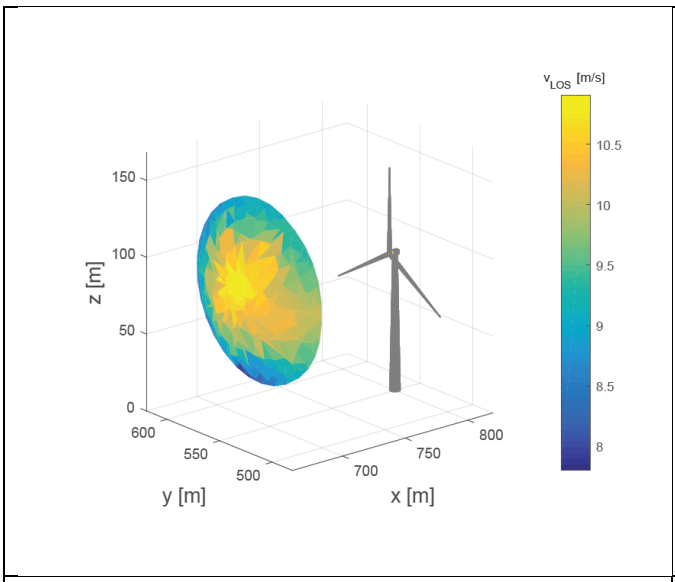

Figure 1: *SpinnerLidar measurements inside an LES wind field calculated by a lidar simulator.*

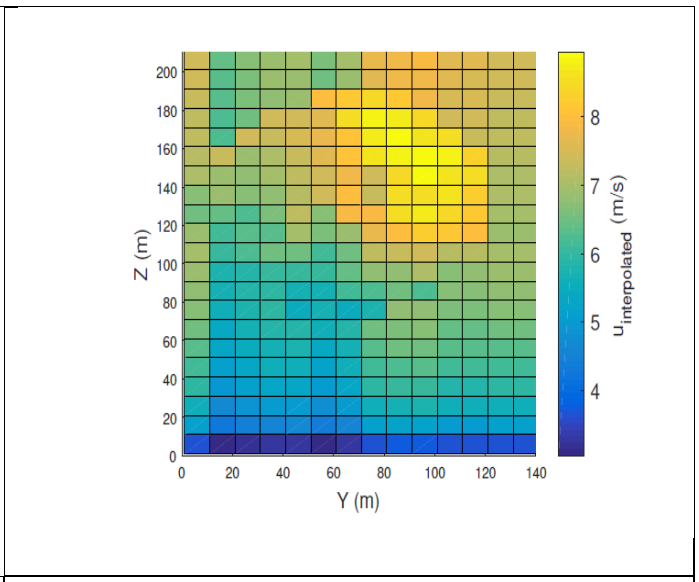

Figure 2: *Snapshot of the turbulence box extracted from the SpinnerLidar measurements*

Scope:
Aeroelastic simulation codes are used during the design phase of a wind turbine in order to determine the load characteristics. In general, aeroelastic codes require the aerodynamic information along with the inflow conditions, which are usually based on the IEC standards. Mostly, the inflow is simulated with the standard conditions/ models. However, it is more beneficial to calculate the turbine behavior based on real wind inflow data. The benefit of such an approach is to get a more accurate assessment of the turbine response thus more accurate fatigue simulations. Ultimately this results in a more accurate forecast of the wind turbine operation.

The SpinnerLidar can measure the inflow at up to 150 m distance upstream of a wind turbine with a 400 Hz sampling rate and a 1 Hz wind field resolution. This gives us an opportunity to measure the inflow to a wind turbine with a high spatio-temporal resolution. In this M.Sc. project the student will analyze a methodology that introduces SpinnerLidar data into an aeroelastic code (FAST) inside a simulation framework. The method will be validated based on simulations and some full field experimental data.

Work steps:
- Introduction to lidar technology and aeroelastic simulation of wind turbines
- Sensitivity study of implementing lidar data into aeroelastic simulations
- Evaluation of data and creation of workflow

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- Comparison and optimization of the workflow based on reference simulations

Requirements:
- Good programming skills with MATLAB
- Basic knowledge of wind turbine aerodynamics
- Independent working ability
- Interest in lidar measurements

Place	ForWind – University of Oldenburg
Begin	As soon as possible
Duration	Ca. 6 months
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