

# IPID4all Senior Research Exchange with ForWind - Zentrum für Windenergieforschung

## Feedback report

*Hugo Olivares Espinosa, PhD*

*Home research group: Uppsala University Campus Gotland, Wind Energy*

*Address: Cramérgatan 3, 62165, Visby, Sweden*

*Head of home group: Dr. Stefan Ivanell*

*Exchange period: February 6<sup>th</sup> – 10<sup>th</sup>*

*Exchange topic: CFD modelling of wind flows and wind turbines*

*Carl von Ossietzky Universität Oldenburg*

*Küpkersweg 70 (Gebäude W 33)*

*26129 Oldenburg*

*ForWind - Zentrum für Windenergieforschung*

*AG Energiemeteorologie - Wake- und LES-*

*Modellierung*

*Host: Dr. Björn Witha*

### Activities / Contacts

The visit was mostly dedicated to learn about the research projects performed by the different groups at Forwind and Fraunhofer IWES. Discussions were held regarding the modelling practices employed by some of these groups in comparison to the techniques used within our group at Uppsala University Campus Gotland. In particular, the modelling of the Atmospheric Boundary Layer (ABL) flows over complex and forested terrains. For this, some details about the concepts applied in the CFD modelling platform used at Forwind –PALM— were examined and compared seeking to improve the methodologies applied in our computations. This was done in connection to the *New European Wind Atlas* (NEWA) project where both host and home research groups participate and collaborate. In addition, discussions were carried out regarding the use of the CFD platform OpenFOAM, employed by our group in Sweden as well as at Forwind and Fraunhofer. These talks covered subjects such as rotor and blade modelling as well as grid generation. Another important topic discussed during these meetings was the reconstruction and analysis techniques applied to data acquisition with Lidar instruments in the study of wind turbine wakes.

During the visit, meetings were held with the following groups and researchers (the topics of discussion are annotated). These were the most relevant:

EnMet group (Energy Meteorology). Head: Detlev Heinemann

- Björn Witha –host– (ABL over forest & complex terrain with PALM, NEWA project)
- Lukas Vollmer (wake modelling, turbine control with yaw, mesoscale ABL simulations)
- Renko Buhr (forest modeling with OpenFOAM and THETA)

TWiSt Group (Turbulence Wind Energy and Stochastics). Head: Joachim Peinke

- Carl Michael Schwarz (CFD Aerodynamics)
- Michael Hölling (experiments in wind tunnel)

WeSys Group (Wind Energy Systems). Head: Martin Kühn

- Wilm Friedrichs, head of Lidar group (Lidar measurements)
- Juan José Trujillo (Lidar measurements of wakes and reconstruction techniques, wake tracking)
- Hauke Beck (Lidar measurements, wake tracking)

Fraunhofer IWES Group. Head: Bernhard Stoevesandt

- Martin Dörenkämper (ABL modelling with OpenFOAM)
- Matthias Schramm (CFD modelling with OpenFOAM, grid generation, wind turbine siting)

Visiting Prof. Stefan Heinz (University of Wyoming, USA)

- The use of lagrangian sub-grid models for large-eddy simulations of forested terrain

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## **Future collaboration / Outlook**

Current and future collaboration with the host group take place within the framework of the NEWA project. Collaborations in other fields are also possible. For example, to get insight about the techniques developed at Forwind for wake tracking and reconstruction techniques for Lidar measurements.

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