PhD on Multiple Turbine Wakes

November 2011 to November 2014

Intended work / First investigations

* Photographer: Christian Steiness. 12 February 2008 at 13.00

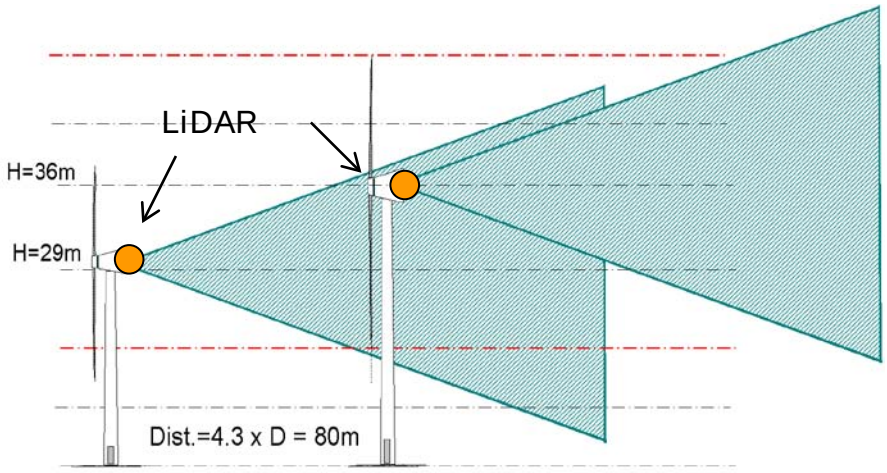
Supervisors: Gunner Larsen, Jakob Mann

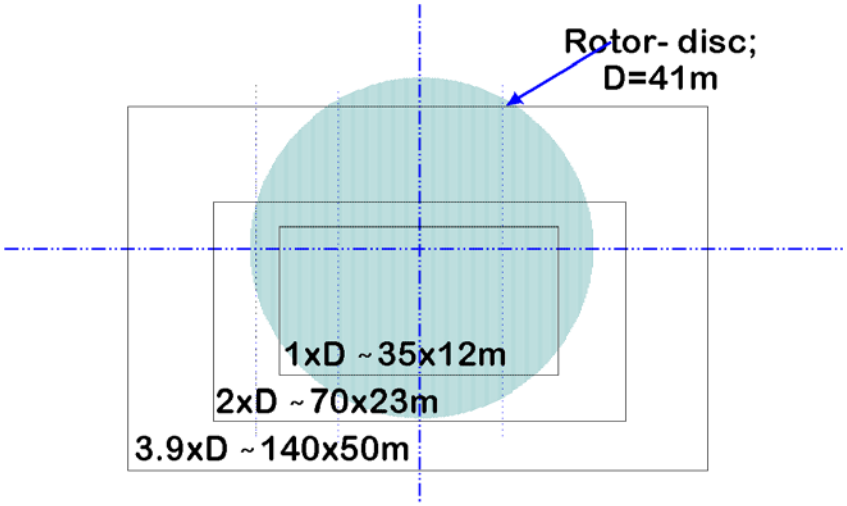
Introduction to the PhD Project

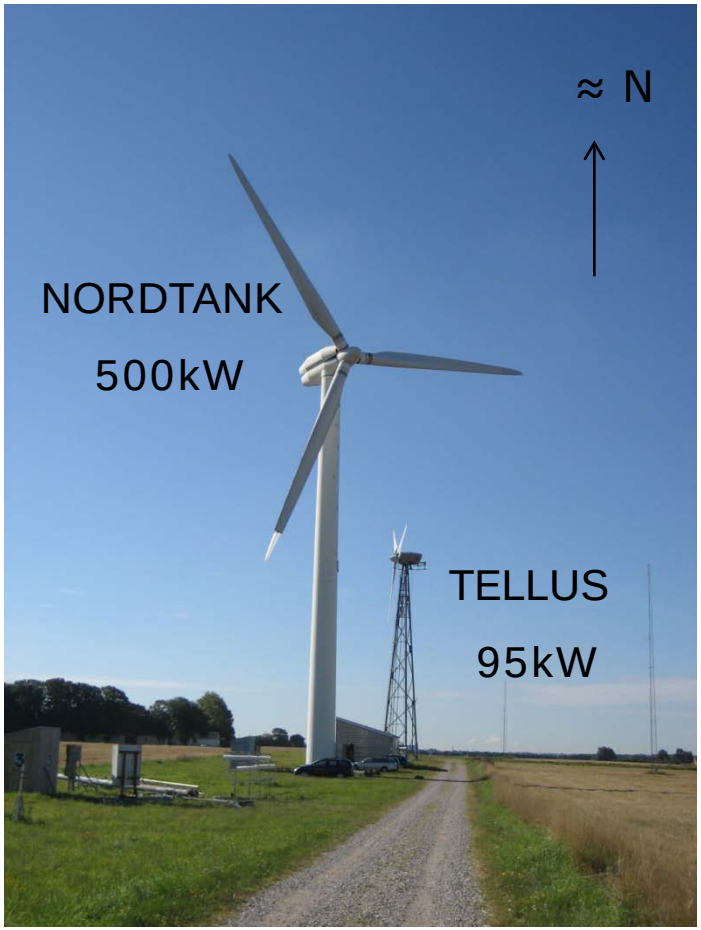
Multiple Turbine Wakes

- Overall purpose → modeling of wind farm flow fields
  - Study of interacting wind turbine wakes, 2-string approach:
    - Experimental: analysis of dedicated innovative full-scale recordings
    - Numerical: detailed CFD studies, LES - ACL
  - Engineering approach
    - Capturing the essential physics
    - Practical model (computational efficient)
    - Model verification

Experimental set up

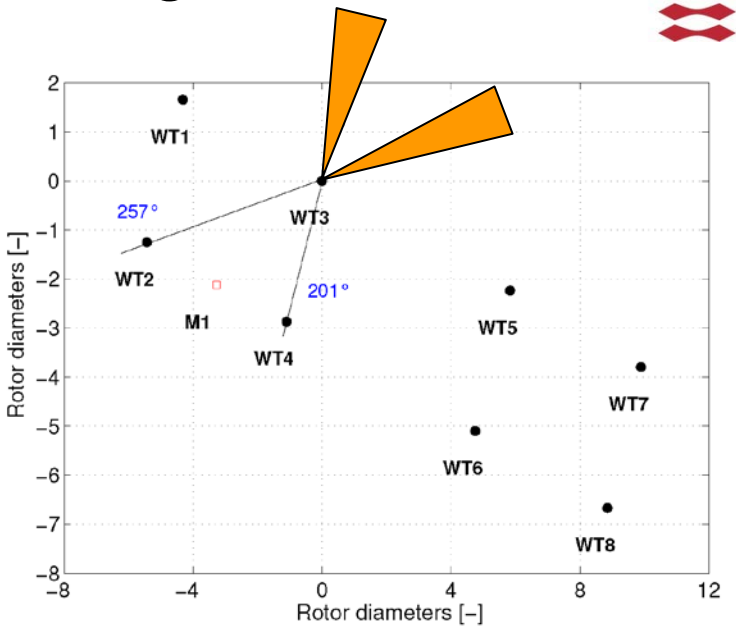




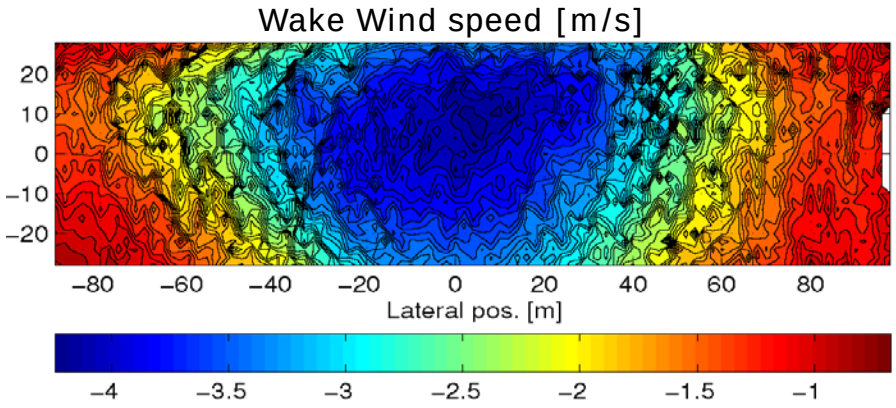


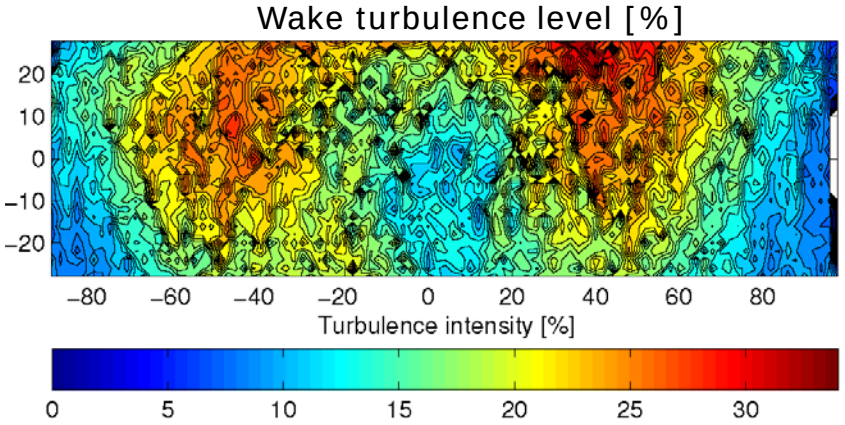
Previous merged wakes investigations

- Tjæreborg EU-TOPFARM full scale LIDAR based measurements campaign
  - Several hours of single, half and full wake situations recorded in 2009



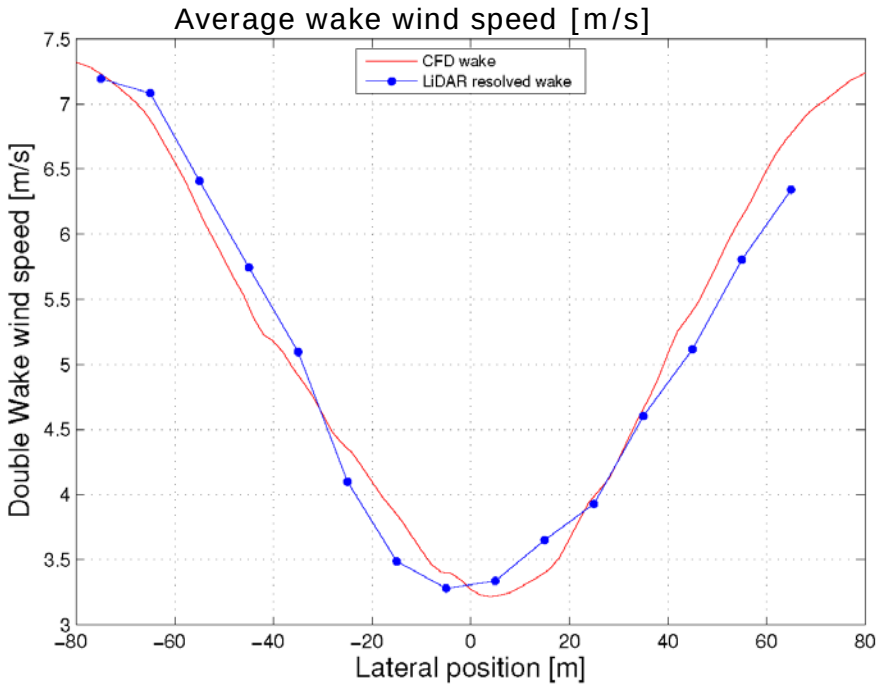
- Example of LiDAR resolved double wake

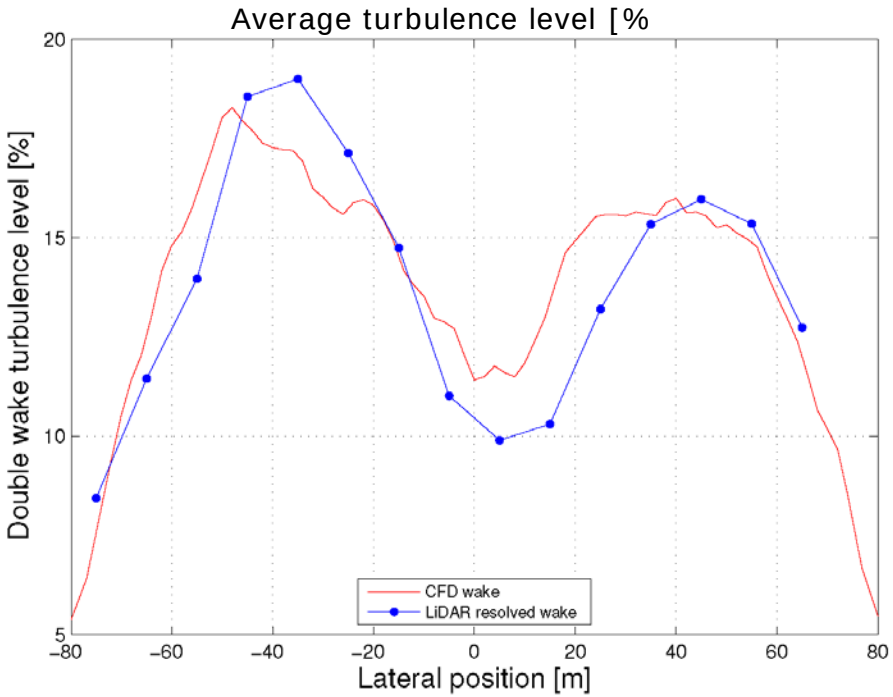




Previous merged wakes investigations

- Comparison with full 3D wake computations using EllipSys solver, actuator line, LES, turbulent and sheared inflow.





FC=200m, <U0>=7.25 m/s, <TI>=3%, Seperation: 446m

- Agreement on power ratio between CFD and measurement within 2%

End