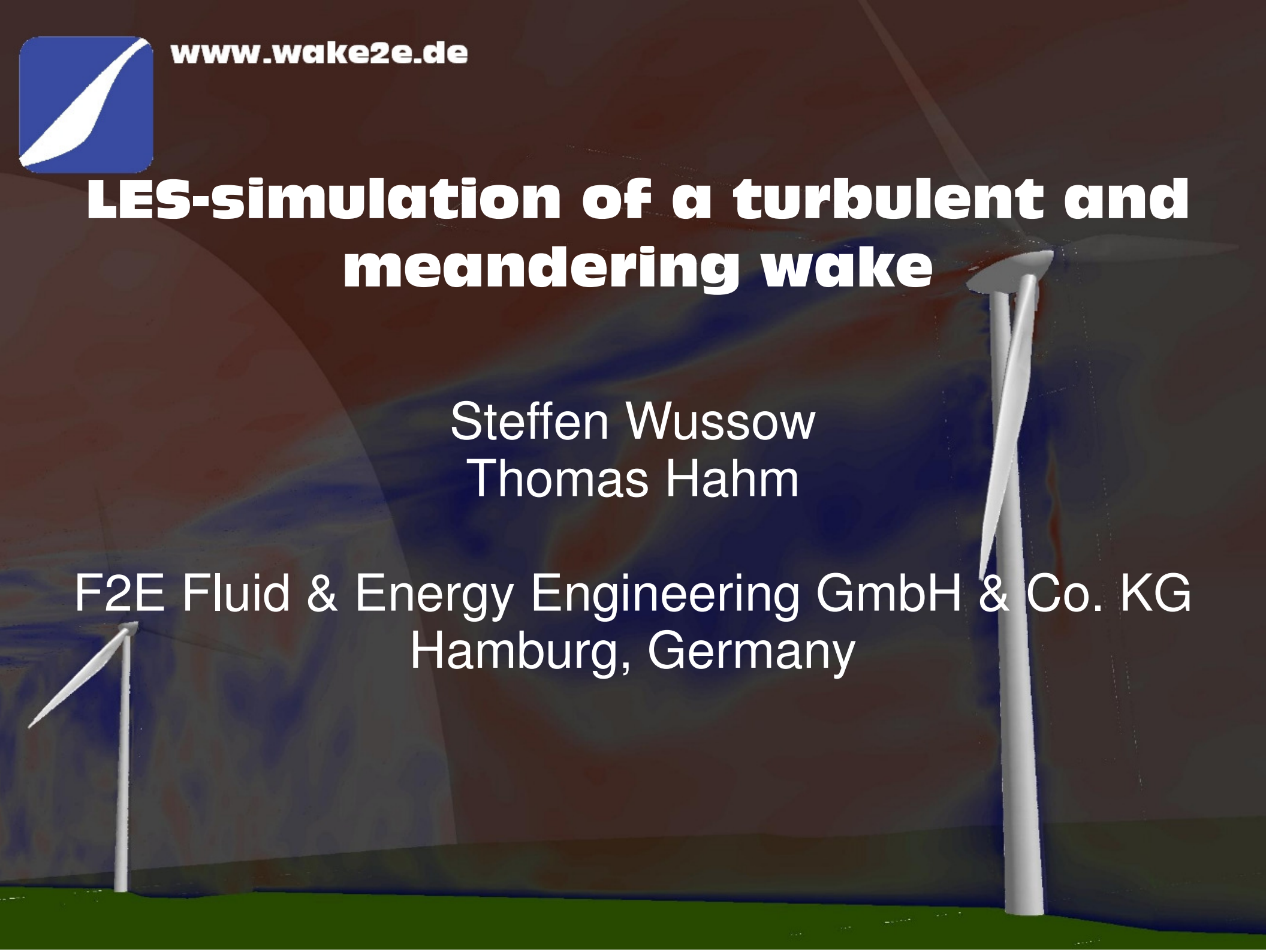

www.wake2e.de

# LES-simulation of a turbulent and meandering wake

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- Short description of the model
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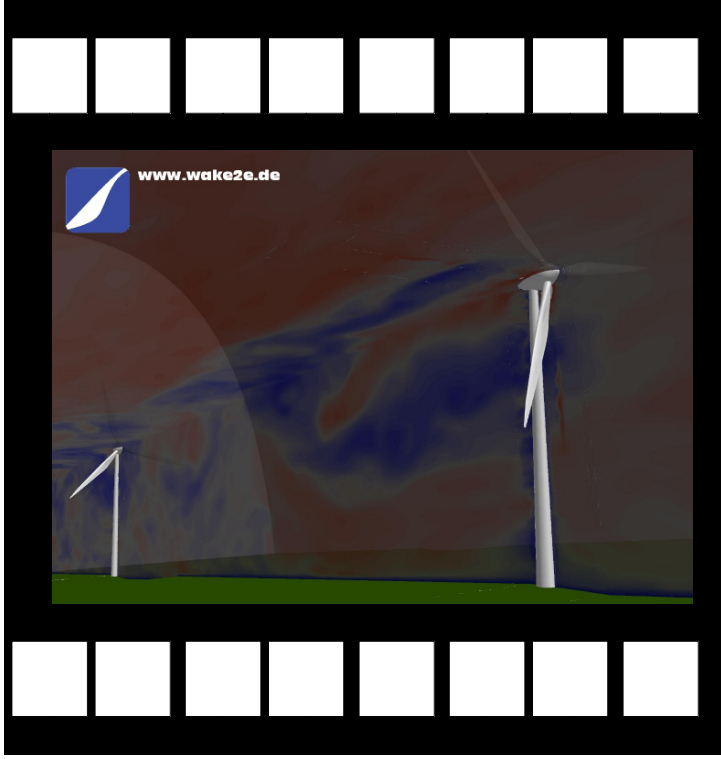
# Introduction

- **Motivation**: inside a wind farm WTs are subject to turbulent wakes. A detailed knowledge of these wind fields is necessary to better understand the wind loads and the power performance in (closely spaced) wind farms.
- **CFD**: can provide 3-dimensional wind fields for e.g. BEM-based models
- **History**:
  - 2000: RANS, k-ε-turbulence-model
  - 2003: DES (DIBt research project)
  - 2007: LES
  - 2009: LES (improved)

# Short description of the model

- **Software**: ANSYS FLUENT 6.3
- **WT modelled**: 2 WT ENERCON E66, hub height 65m, spacing: 4.25D
- **Turbulence Model**: LES with Smagorinsky-Lilly Subgrid-scale-modell
- **Grid**: Domain extent 1.5 RD upstream and 3D downstream of the second WT. Pure Hexader grid (7.8 million cells). Full WT geometry, rotating hub, blades can be pitched individually
- **Wind input**: 3 component von-Karman-Model
- **Data**: 50.000 measuring points, monitoring rate 10Hz. Located at 2.0, 2.5, 3.0 and 3.5D behind the first WT

# Animations

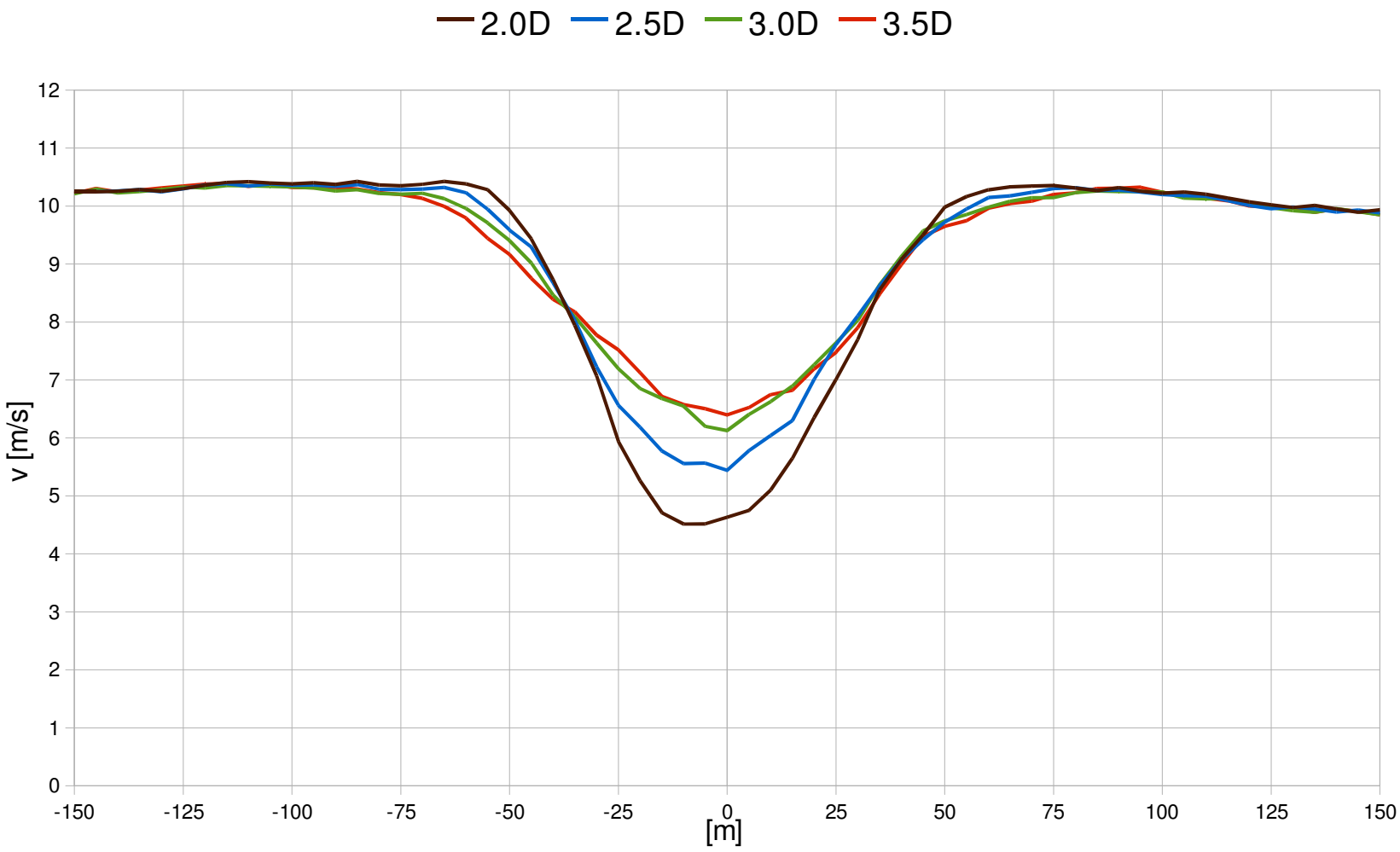



**Weblink**:

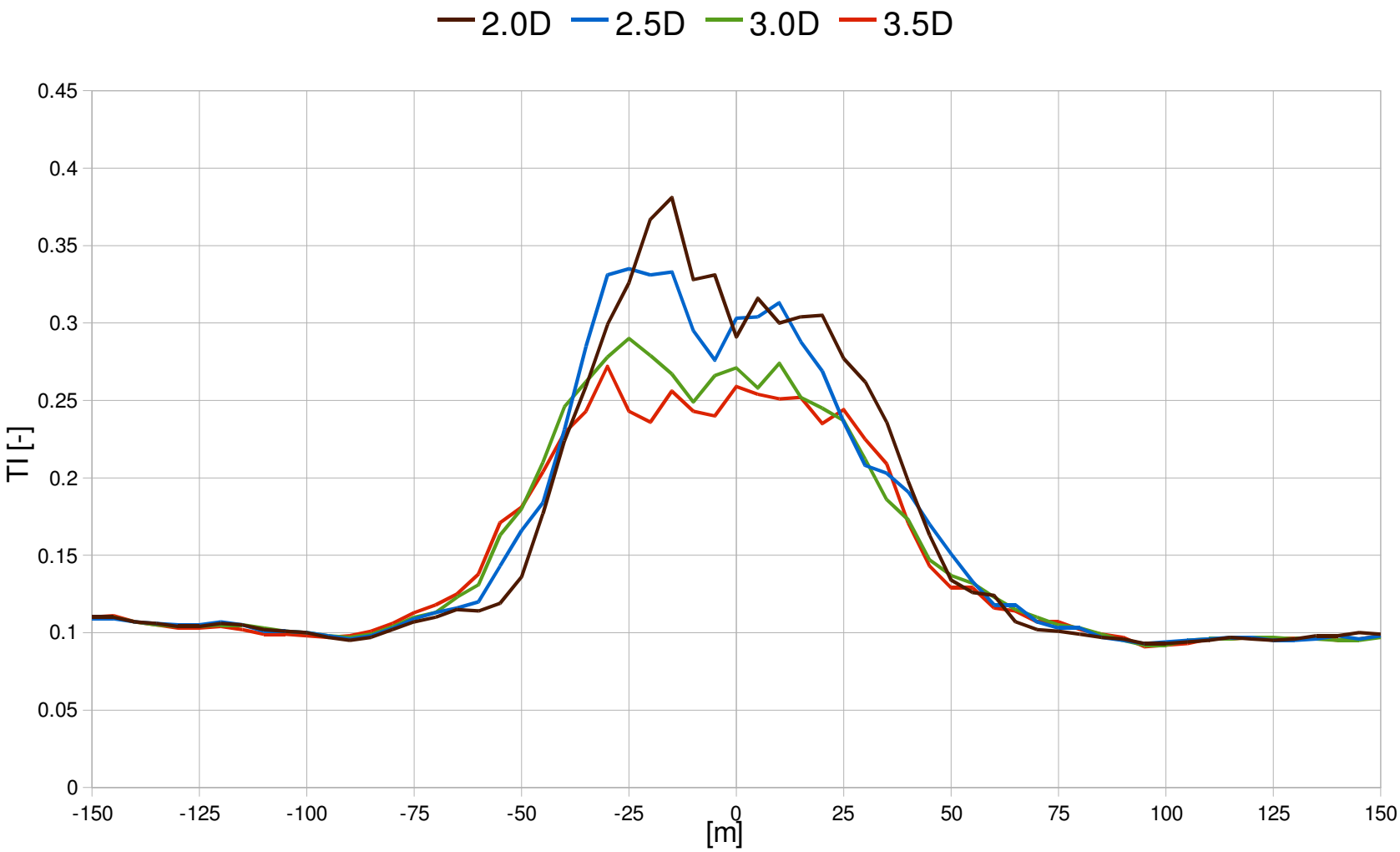
You can find an animation on **www.wake2e.de**
Click F2E → CFD Animation on the left side of the page.

Direct link to animation:
**https://www.wake2e.de/index.php?option=com_content&view=article&id=72&Itemid=77&lang=en**

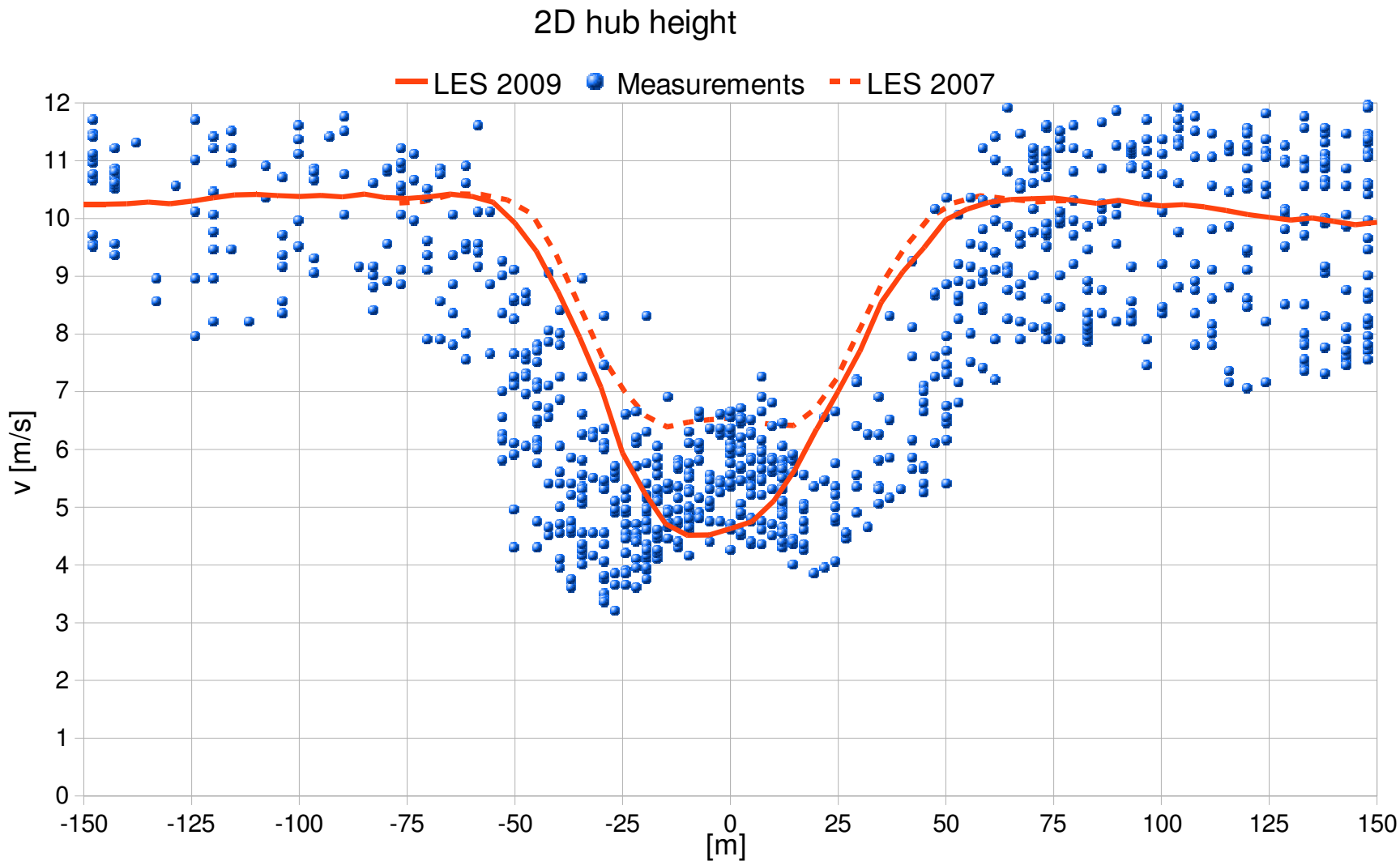
# Results: mean velocity at hub height



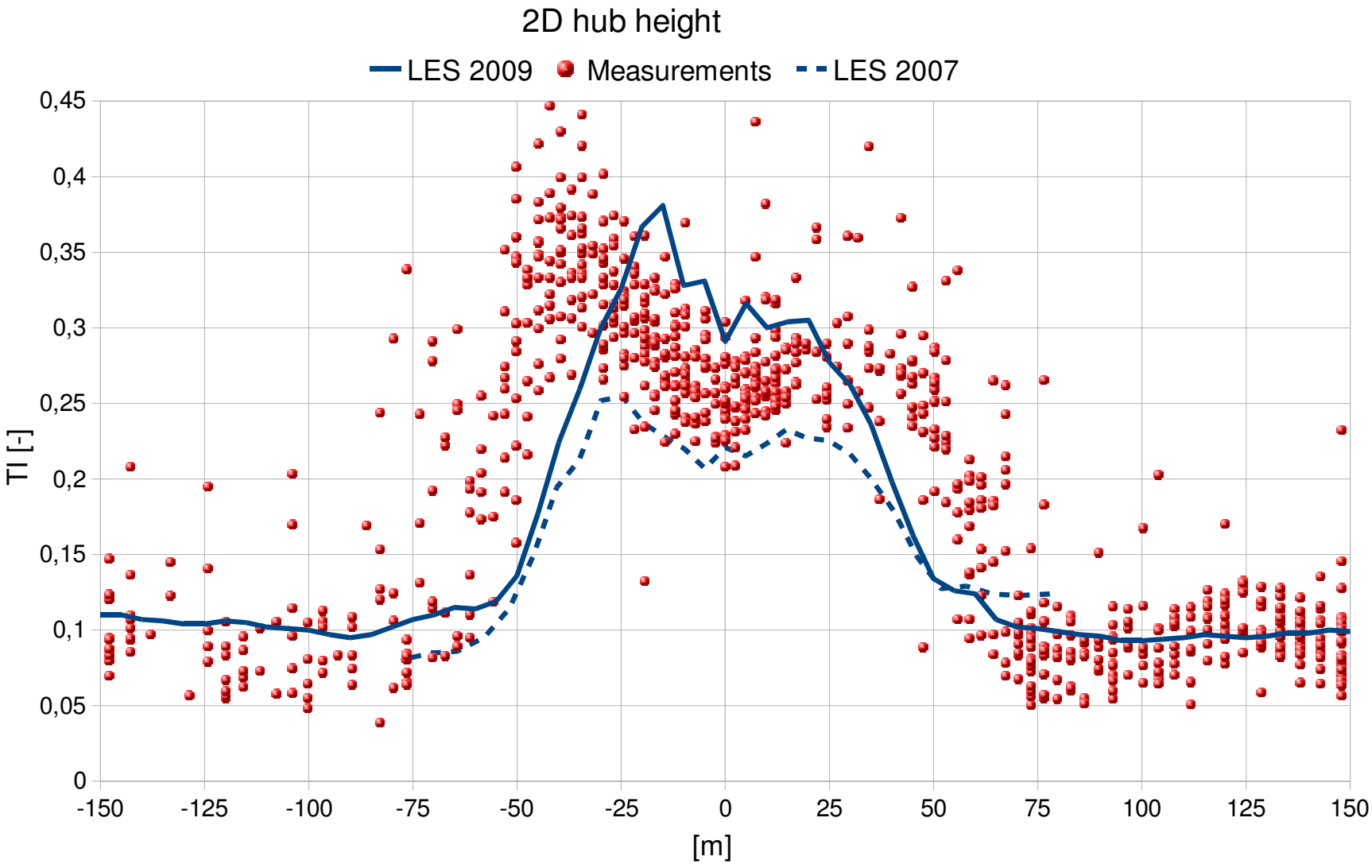
# Results: turbulence intensity at hub height



# Comparison – velocity profile



# Comparison – turbulence intensity



# Outlook

- Transfer wind data to input files for BEM based models
- Perform CFD-simulation with different wind models and conditions
- Implement control algorithm of WT