

### Comparison of Inflow variables and error detection using LiDARs EMS Prague 2014

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## Outline

#### Introduction



3 Tower and Wake effects



4 Future work on wind evolution models

#### Conclusions 5





## Introduction

#### Lawine Setup



Fig. 1: Lawine project setup under TKI Wind op Zee





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# Introduction

Setup for Comparisons



Fig. 2: Setup for comparison of inflow parameters





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# Comparison of inflow parameters

Linear regression results

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Fig. 3: Linear Regression for wind speeds(m/s) Lidar Vs Sonic at 108m



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# Comparison of inflow parameters

**Comparison of windroses** 



Fig. 4: Windrose Sonic at 52m height



Fig. 5: Windrose Sonic at 108m height





### Comparison of inflow parmeters

Windroses after corrections





Fig. 6: Corrected windrose Sonic at 52m height

Fig. 7: Windrose Sonic at 108m height





### Comparison of inflow parameters Wind direction correlation



Fig. 8: Wind direction difference between wind vane and WC2 at 80m height

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### Comparison of inflow parameters Lidar position affecting results



Fig. 9: Presence of thick guy wires near the Lidars





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### Tower and Wake effects Site layout map



Fig. 10: Layout around the metmast 3 used for data





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### Tower and Wake effects

Wakes around the met mast







### Tower and Wake effects

Wake effects through wind speed ratio

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Fig. 12: Wind speed ratio between WC2 and Sonic anemometer at 52m, 80m and 108m heights



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### Tower and Wake effects

Wake effects through wind speed ratio

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Fig. 13: Wind speed ratio between WC2 and Cup anemometer at 52m, 80m and 108m heights



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### Wind model development

Lidar setup for wind model development



Fig. 14: Wind turbine with forward scanning pulsed Lidar



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### Wind Model development

#### Wind model flow diagram



Fig. 15: Wind model flow diagram





### Conclusions

- Lidar measurements correlate well with other sensors
- Corrections of the measurement data with the help of Lidars is possible
- Due to averaging of 4 beams, Lidars average out the tower effect
- Lidars could be used for wind resource assessment in flat terrain
- Lidars wind direction self calibration is affected by presence of huge metal structures nearby



