Authors reply to comments from Andrew Scholbrock

Dear Andrew Scholbrock, thank you very much for your kind remarks and the suggested improvements. In the following I will answer the comments in detail.

SC1. *For figure 2, what instrument was used to measure the wind direction? I think this should be mentioned in the caption and the body of text. It is something to consider when the statistics of the measurement are analyzed, which they are discussed later. If it is a met mast measurement, which way is the boom oriented on the tower? Is tower shadow a concern?*

AC. The wind direction was measured by a wind vane that was installed on a boom at a met mast in 89.4 m height approx. 1 m above the main structure of the met mast. Small disturbance could be introduced from wind directions around 134° since another boom was located in a distance of 1.65 m in that direction, to which the highest cup anemometer was attached. For the evaluation in the manuscript this was not considered, since this wind direction rarely appeared in the used dataset and the effect should be marginal. I will add the information of this paragraph to section 2.4 of the manuscript.

SC2. *Figure 3: could you add legends to the plots?*

AC. Legends will be added in the revised version of the manuscript.

SC3. *In section 3.1, for the stochastic properties of wind direction, I don't see a mention of atmospheric stability, or turbulence intensity. I would think that these atmospheric quantities would correlate somewhat to the variability of the wind direction. I think it would be good to include something about this in this section.*

AC. For the analysis of the stochastic properties of the wind direction only the wind direction measurements were used in the manuscript. However, in the period from 26th July 2016 to the 22nd November 2016 the Monin-Obuhkov length (MOL) could be derived from measurements of a meteorological measuring station at the location. The classification from MOL into stability classes was done according to (Bromm et al., 2018). The histogram of the 5-min standard deviations of the wind directions divided into the stabilities *unstable, neutral* and *stable* is shown in Figure 1 (left). The right figure shows the respective empirical probability for each bin.

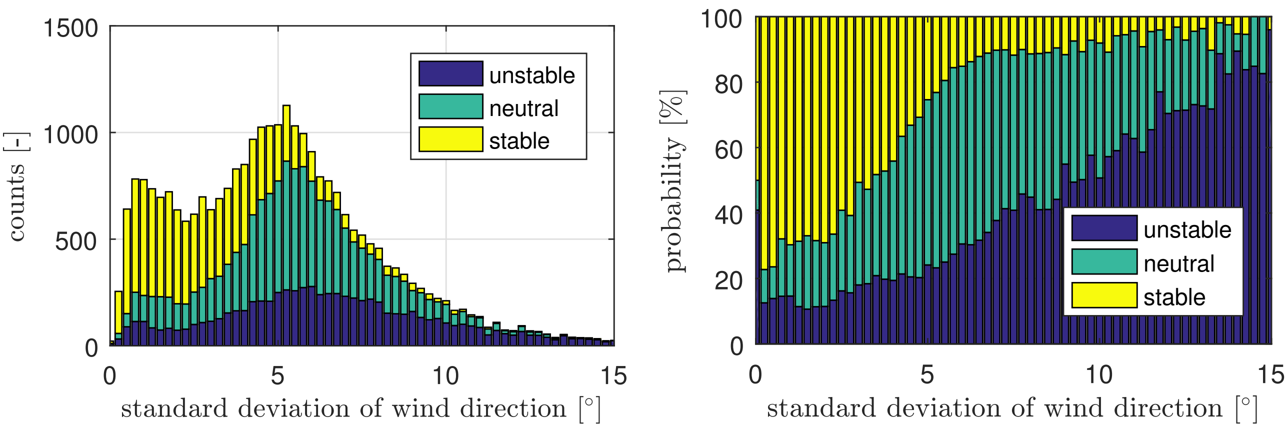

Figure 1: (Left) Histogram of 5 minute standard deviations of the wind direction separated in the categories of atmospheric stabilities stable, neutral and unstable. (Right) Normalized histogram of the data

The histogram shows two pronounced maxima. One by approx. 1° and the second by approx. 5.25°. It appears that the distribution consists of two composite distributions. The first, with the focus around 1°, is dominated by measurements in stable atmospheric estimation and the second, with the focus around 5.25°, consists mainly of neutral ones. The higher the standard deviation gets the more likely it is to have unstable stratification, as it can be seen in Figure 1 (right). Figure 1 (left) together with a description will be added to the manuscript to mention the connection of the stochastic properties of the wind direction with the atmospheric stability.

References

Bromm, M., Rott, A., Beck, H., Vollmer, L., Steinfeld, G., and Kühn, M.: Field investigation on the influence of yaw misalignment on the propagation of wind turbine wakes, Wind Energy, pp. 1–18, https://doi.org/10.1002/we.2210, URL `http://doi.wiley.com/10.1002/we.2210`, 2018.