

We would like to thank Stefan Emeis for taking the time to read and react to our manuscript. In the following, we would like to address some of his criticisms.

The manuscript by Neunaber et al. investigates the wakes of one and two turbines in a wind tunnel study. Unfortunately, the title and the abstract tell a completely different story. The wind tunnel is not mentioned at all in the abstract. In this title and abstract are completely misleading.

This has been addressed and the title and the abstract have been adapted accordingly.

This is a pity, because the idea conveyed in the abstract is interesting as well. There exists a large body of literature on turbulent wakes behind flow obstacles since decades. To use part of this information for today's wind turbine wake research is desirable and also challenging. But, unfortunately, this does not seem to be the major topic of this manuscript. It only presents a comparison of one of these older wake theories with a wind tunnel study.

We agree that the abstract may have given the wrong impression that there were many wake theories, and we have changed it accordingly. We would like to point out that we are successfully applying the only analytical solution that exists today for the self-preserving axisymmetric turbulent wake to the wake of a wind turbine. While the theory itself is not new, this study gives valuable insight into how the description of a wake from a turbulence point of view can help to improve the understanding of the turbulence within a wind turbine wake and adapt engineering wake models.

Sentence number 4 of the abstract reads " However, although wind turbine wakes have been subject to various studies, they are still not fully understood." But no references are given. There have been large field experiments in recent years in order to learn about wakes behind larger offshore wind turbine arrays (the title of this manuscript says that this is a study on wakes of wind turbine arrays!). E.g., Platis et al. (2000) give an overview on what was achieved in the offshore wind farm wake experiment WIPAFF in the North Sea where aircraft conducted in situ measurements within the farm wakes. A general overview on onshore and offshore wind turbine wake experiments could be obtained from Sun et al. (2020)

- In this manuscript, we are investigating the wakes of a single turbine and a wind turbine exposed to the wake of an upstream turbine, which we now clearly point out in the title and in the abstract. We agree that we were not sufficiently specific in the first version of the paper. As these wake scenarios occur inside a wind farm, they should not be mixed with the investigation of whole wind farm wakes. However, it would definitely be interesting to see in the future whether parts of Townsend-George theory could also be used to increase the understanding of the wake of a wind farm. We therefore picked up this point in the conclusion of our manuscript.
- As this manuscript focuses on the application of the Townsend-George theory on wind turbine wakes by using wind tunnel data, we do not include a general review of wind turbine wake experiments or wake models, as this has been done by other works.

Also not mentioned are modelling studies, e.g., those by Fitch et al. (2012) or Volker et al. (2015). The experiments mentioned before and the model simulations fit together in many aspects. I.e., quite a lot has been learned about wind turbine wakes in recent years.

While we agree that a lot of interesting results have been published in the past years, as indicated above, the focus of this work is on what can be learned from the application of the Townsend-George theory to wind turbine wakes. Also, as already mentioned, we do not include a general

review of wind turbine wakes but include specific information where needed and give references. As we agree that the description of the wind farm wake is an interesting point, it is now commented on in the conclusions.

As already stated, we agree that the focus of our work on the wake of a single turbine for different inflow conditions was not clearly stated in the previous version of the manuscript. Definitely, for the wide context of wakes in farms, these are excellent papers.

I therefore would like to suggest a major revision of this manuscript. It could turn out to become a highly interesting paper in the end covering a highly up-to-date subject in renewable energy research.

References

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