

Interactive comment on “Impacts of the Low-Level Jet’s Negative Wind Shear on the Wind Turbine” by Walter Gutierrez et al.

Anonymous Referee #2

Received and published: 27 July 2017

Referee Comment on WES-2017-22 "Impacts of the Low-Level Jet’s Negative Wind Shear on the Wind Turbine" by Gutierrez et al.

The manuscript investigates the impact of so-called low-level jet (LLJ) atmospheric flow situations on the loads induced on horizontal axis wind turbines (WT). Appropriate measurement data periods of a 200 m met tower are selected and used to generate input wind fields for FAST simulations. Resulting loads from these simulations are compared with respect to the vertical position of the LLJ relative to the WT hub height. As a main result, loads on non-rotating components are generally reduced when negative shear is induced by a LLJ within the rotor area.

The paper addresses a topic of high interest, especially for possibly larger WTs of the future. The data and methods used are - as far as explained - sound and consistent,

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and the results are relevant. Publication of the manuscript in a revised form is therefore recommended.

General comments

1. Altogether, the manuscript is lengthy. The authors should consider to identify the key cases and results and concentrate on these. Also the literature review, while much appreciated, appears to be more extensive than necessary.
2. The manuscript reads quite technical and should be improved in terms of a dedicated research question and a rigorous sequence of steps and arguments to give answers to that question. Most of the necessary elements are already mentioned in the paper, but they should be better worked out. The research question is actually indicated in the introduction, P2L17. However, the introduction does not lead the reader to this question, nor is a sequence of investigative steps directly developed from it.
3. On P7L7-8 the generation of the necessary 2D wind fields evolving in time from raw met tower measurement data is only indicated but not sufficiently explained. As this is a central step in data processing where assumptions and simplifications have to be applied, a more detailed description is necessary.
4. On P7L31-32 it is explained that simulations were performed using the NREL WindPACT 1.5MW WT. Compared to the current state of technology, this is a rather small machine. It seems that at least the NREL 5MW WT would have been more appropriate, especially considering the focus of the manuscript on future, very large and tall WTs. Please comment on this and justify the WT model selection.
5. The results indicate reduced loads and deflection amplitudes for several WT components in case of an LLJ. These improvements should be made quantitative in some meaningful way and presented, e.g., in a table, probably only for selected cases. Thus an impression of their relevance would be given.

Specific comments

1. Fig. 1 could probably be canceled. Its information contents is minimal and mostly repeated in Fig. 2, if the caption is adapted accordingly.
2. Notation: The vertical axes in Figs. 3-10 are labeled $(z-z_0)/R$ while the captions mention "Variation with ξ ", and Eq. (3) defines ξ slightly different from the figures. Please clarify and use ξ consistently throughout the manuscript, avoiding confusion of the reader. For the same reason also use the symbol ξ in axis labelling of the figures if appropriate.
3. In the conclusions, P18L6, the term "torque" should be explained more precisely. Torque on which component(s) and with respect to which axis?

Interactive comment on Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2017-22>, 2017.

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