Reviewer 1 Comments and Responses: Debnath et al. wes-2020-103

In this document, the reviewer's comments are in black and the author's responses are in blue.

The authors thank the reviewer for the valuable and useful comments. It is believed that the quality of the manuscript has been improved a lot by the suggestions provided.

General comments:

From a more general point of view of applied science, I find the discussion on the use of the shear exponent in LLJ and high wind shear conditions very important. The observation in the manuscript, that the shear coefficient (usually denoted alpha) is not a good measure of the extreme wind shear conditions that might pose problems to wind turbines is very important, because the use of the shear exponent (alpha) is recommend in the IEC (2019) standard. I therefore suggest putting more emphasis on this shortcoming of the shear exponent and even mention the finding in the abstract.

We thank the reviewer for the kind remarks and have added the below sentences into the abstract.

"In designing a detection algorithm for these events, we find that the typical, non-dimensional power law-based wind shear exponent is insufficient to identify many of these extreme events. Rather, the more simple vertical gradient of wind speed is more suitable."

Specific comments:

1. Lines 180 – 190 and table 2. With an uncertainty of 0.1 degree C on the temperature plus any unknown bias in the temperature measurements, it is not reasonable to give the temperature with 3 decimals. Furthermore, the difference in temperature between the two sites is within the uncertainty of the observations. This makes these findings scientifically weak, dubious and non-convincing. I suggest simply to remove.

We agree with the reviewer and have changed the decimal points for the temperature in the table. The sentence "the difference in temperature between the two sites is within the uncertainty of the observations" has been removed.

2. Line 62: VLLJ is not defined – actually why introduce VLLJ and not just name it LLJ, which is very well-established meteorological phenomena.

We understand the reviewer's point and have changed the term "vLLJ" to simply "LLJ" throughout the manuscript. By introducing this term, we simply wanted to distinguish between the LLJ events in which we observed a jet below 200 m height and those in which there was a jet of nose height above 200 m. However, we see that this could come off as a different phenomenon from the well-established LLJ.

3. Line 104: The usual and well established drop off is 2 m/s, please comment on this in the manuscript and explain why this generally accepted value is not applied here.

We have chosen slightly lower value due to the limited vertical extent of the measurements (i.e., 200m). It is described in the text as (L106-L108): the enforcement of both dimensional and non-dimensional wind speed drop off criteria is based on previous work (Baas et al., 2009) but the threshold values are adjusted in magnitude here due to the limited vertical extent of the measurement data available.