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Interactive comment on "Extending the life of wind turbine blade leading edges by reducing the tip speed during extreme precipitation events" *by* Jakob I. Bech et al.

Anonymous Referee #2

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Summary of review: The manuscript presents relevant information for the wind industry, however, the methodology which is believed to be the core of the manuscript is not described. Reference and credit to previous work has not been made, this questions the originality of the manuscript and raises the question, what is the contribution of the authors to the scientific community? The manuscript can be accepted with major corrections. Specific comments about are provided next.

Specific comments: Section 1: Line 5-10 suggests that whirling arm test does not reflect real loading of blades as there are other environmental parameters that may impact its response. This is correct, but how is this linked to rain erosion testing?

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Discussion on test factors affecting test data may be relevant.

Line 15-20 states the following: “Also, in order to reduce the torques and loads, it may be attractive to increase the tip speeds even further on future turbine designs. Consequently, alternative strategies of mitigation of LEE should be explored. Such an alternative strategy is the reduction of the tip speed during highly erosive conditions (Wobben, 2003). It is likely to be feasible to extend the leading edge life by reducing the rotor speed during extreme precipitation events occurring at a very little fraction of the service life, but accounting for the majority of the erosion damage.” Please include definition of extreme event in terms of rain drop size and number of drops, or, state where it will be covered.

IEC61400-22 standard is a certification standard, how is this used in the context of the manuscript is unclear.

Section 2.2: Line 5 in this section sates: “Many designs have a layer of putty or filler 5 on the GFRP to make a smooth surface for the coating.” Any reference on the statement above?

Section 3: No information about specimen geometry and material is provided, including thickness and roughness. Please include this information. This information is needed for the parameters presented in Table 1.

The following paragraph needs elaboration to make it more clear “It should be noted, that the time to removal of coating at position “i” is likely to be influenced by the adjacent erosion at position “i-1” as the damage progresses from an area of high velocity towards areas with lower velocity.” Figure 3 reads . . . Wöhler curve. Unclear what is the intention/definition to use or mention Wöhler curve. Further elaboration is needed.

Section 3.2: No references were provided and no description of units for each parameter. Is this the original contribution of the authors?

Section 4: This section does not define how rain data is used in the manuscript. A flow

chart will assist in the understanding of the methodology. Definition of convective rain is not provided. Please make sure all definition used in the manuscript are defined or provide reference where are those defined. Furthermore, Figure 8 refer to a reference, but not in the text, what is the author's intention here.

Section 5: Section 5.1.2: Reference to a model is made, however, model is not presented or defined. Please clarify and elaborate as needed. This will affect the whole section 5. Section 5.1.4 – Figure 12 has a far too long caption, please consider including the description into the body text of the manuscript. Section 5.1.5 – no references at all. Is this something the authors are proposing? Please update accordingly.

Section 6: The following is states "This paper is a concept paper proposing a framework for prediction and mitigation of leading edge erosion." The framework needs to clearly described. On page 21, the following is stated "The correlation between droplet size and damage increment depends a lot on the material, leading edge configuration and failure mode. For surface cracking of brittle top coats the many impacts with smaller droplets may generate more accumulated damage than the few large droplets as suggested by Amirzadeh et al., (2017). However, for elastomeric protective coating the damage mode may be debonding from the top coat/gelcoat, and in this case it may be opposite." Please elaborate and explain reason for this.

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