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Interactive comment on "Brief communication: Nowcasting of precipitation for leading edge erosion-safe mode" *by* Anna-Maria Tilg et al.

Anonymous Referee #1

Received and published: 29 March 2020

General Comments:

The authors present an interesting concept that aims to anticipate severe precipitation events. This can be used to inform an erosion-safe mode and reduce the tip speed of a turbine before the event impacts. The concept addresses the limitations of using forecasting approaches. Overall, I believe this paper would be suitable for publication if the following points are addressed.

The study builds on work from Bech, 2018 and Hasager, 2020. I would consider including a paragraph introducing their work and findings so that the reader can understand how this work fits into the wider research.

The authors need to consider the worst case scenario in this study. If high intensity

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Discussion paper

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events cause the most erosion damage, then how the nowcasting would respond to an extreme intensity event needs to be presented. If an extreme, highly damaging event does not provide enough time for the turbine to be slowed than there is a limit on the application of the erosion-safe mode. The concept has been presented successfully for a moderate intensity event.

Specific Comments:

1. Page 1, sentence starting line 18, “Therefore, the method. . .”.

I do not think that you should say the erosion safe mode is a “solution”. As far as I’m aware, the erosion-safe mode has not been proven on an in-operation wind turbine. It would be more appropriate to present the safe mode as a “theory” e.g. “Bech proposes the idea of reducing tip speeds. . .”

2. Page 2, sentence starting line 54, “Raindrops have diameters. . .”.

A reference to a study where 8mm and 10mm droplet diameters have been recorded is required. Alternatively, data validating this sentence should be provided.

3. Page 3, paragraph starting line 73, “Assuming a raindrop with. . .”.

How does the fall time change when you take a worst case scenario (i.e. largest recorded droplet size, minimum aerodynamic drag from the altitude, etc)? If the erosion-safe mode is only intended to be used in severe precipitation events, the severe case needs to be presented.

4. Page 4, paragraph starting line 108, “Figure 1 shows the. . .”

Can you show a radar reflectivity for a high intensity event? You present a plot for an intensity of 5 mm/h and calculate that rain arrives at the ground after two minutes. As with the previous comment, the worst-case scenario needs to be presented. How would this differ for an extreme intensity of e.g. 100mm/h? Is it still possible to reduce

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the tip speed of the turbine before the event arrives? Also, you should consider the height of a turbine in your calculation, rather than time to the ground.

5. Page 4, sentence starting line 123, “The MRR measurements are. . .”.

Can you provide a reference to flow disturbance around disdrometers?

6. Page 6, sentence starting line 145, “This nowcasting technique. . .”.

You mention that the technique can be applied offshore. However, earlier in the paper you discuss uncertainties in offshore radars, which indicates there are challenges to using this offshore. Can you extrapolate on this point to clear up the confusion?

Technical Corrections:

1. Page 3, sentence starting line 63, “The fall velocity of a. . .”

Change to: "Besides its shape, the fall velocity of a hydrometeor is controlled by three forces:. . ."

2. Page 3, sentence starting line 66, “This increase is linearly. . .”

Replace "linearly" with "linear"

3. Page 6, line 136.

Remove extra line after "4 Conclusion’"

Thank you for considering my comments. I found this work interesting and believe it could help in addressing leading edge erosion.

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