

Reviewer Comments – Estimating reflectivity values from wind turbines for analyzing the potential impact on weather radar services

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General Comments

The author explores a simplified technique to estimate the potential impact of wind turbines on weather radar returns, namely reflectivity. More sophisticated optical models are used to validate some of the proposed simplifications. Outputs from the more sophisticated model are presented as evidence of some assumptions made in the overall simplification. The reflectivity estimates are presented as a measure to estimate the impact of wind farms on weather radars, until such time as signal processing mitigation techniques are available.

Much of the paper focuses on the simplification of the wind turbine/radar interaction. In doing so, the author does make assumptions about wind farm locations and impacts. It is often unclear what reference frame the parameters refer to. Some of the conclusions are based on validation that is difficult to corroborate as little information is provided regarding the optical model simulations, and no real wind turbine data is provided. However, the exercise is useful in the effort better estimate wind turbine impact for a variety of weather radars, and can likely be extended to other frequencies.

Specific Comments

Abstract

1. Page 1478, Line 4
Replace ‘Since nowadays’ with ‘Current’

Section 2

1. Page 1480, First Paragraph
Avoid enclosing statements in parenthesis in the manner used in this paper. Commas should be used instead. The use of parenthesis is colloquial and should be reworded to be more formal.
2. Page 1480, Line 6
Signal blockage is mentioned, but is not discussed in the paper other than the paragraph beginning in Line 20. Mention that this paper does not focus on addressing the signal blockage estimates.
3. Page 1480, Line 14
Add a sentence or two discussing how the stationary clutter increases the noise floor.
4. Page 1481, Line 19
Replace ‘neither’ with ‘nor’

Section 3

1. Page 1481, Section 3
Consider moving this section to be the opening statements of Section 4, Methodology, prior to subsection 4.1.

2. Page 1481, Line 26
Remove the statement in the parenthesis.

Section 4.1

1. Page 1482, Line 22
Remove the parenthesis and include the 300 km limit as a normal part of the sentence.
2. Page 1483, Line 1
The 'less usual' statement seems out of place.
3. Page 1483, Line 1
X-band radars, and shorter wavelength radars, are not more sensitive in general. The sensitivity depends on power, directivity, etc. Remove the comment about the sensitivity, as it is unnecessary for the discussion.
4. Page 1483, -Relative location of weather radar and wind turbine...
In some cases, wind farms are located in flat areas, but it is not true for all scenarios. Further, depending on the distance from the radar, contamination from the wind farm can be significant in the antenna sidelobe region, and extend well beyond the lowest elevation angles. Reword this section to indicate that the study is simplifying the scenario, and does not represent every case, but will serve as a proof-of-concept for the model.

Section 4.2.2

2. Page 1484
Consider combining this subsection with the previous, it is very short to be given it's own section.
3. Page 1484
Add more information about the models. This would be a good place to mention that the model is a tapered cylinder, or a truncated cone. Anything to describe the 'uppermost radius' to the reader would be helpful. Further, it would be useful to know perhaps the kW rating of the turbine for reference.

Section 4.2.3

1. Page 1484
Accuracy is not the correct term to use. Use 'Precision' or 'Quantization' in the subsection title. Accuracy would refer to actual wind turbine RCS measurements to corroborate the model.
2. Page 1484, Line 23-24
It is not apparent to the reader what the theta and phi parameters represent exactly. It should be clear in Figure 1 what phi represents, and that it is referenced to the normal of the blade face and toward the radar along the radar line of sight (I think?). It would also be useful to define a parameter for the blade rotation plane, again with explicit descriptions so the reader can visualize easily.

Section 5

1. Page 1485, Line 19
This is the first mention of the slant surface. A drawing or more discussion about the model (Section 3) should be included.
2. Page 1486, Line 5

When the blades are in a vertical position, shouldn't the maximal return be at 90 degrees? Or is there a slant angle to the blades as well? This should be discussed more in the description of the wind turbine model (Section 3).

Section 6.1

1. Page 1487, Line 8

Remove the term 'really'.

Section 6.3

1. Whole section

Some effort is spent in validating the simplified model against the optical model, but no effort is spent in validating the reflectivity calculation. It would greatly strengthen the work if the estimates for wind turbine reflectivity could be corroborated with real data, particularly the Doppler or blade reflectivity estimate.

Section 7

1. Page 1494

It is not clear how the reflectivity values will be used. Please be explicit to the reader in how this model will aid in the planning for wind turbine clutter impact. Specifically, address the two issues mentioned at the beginning of the paper, clutter and Doppler, and how this technique can help plan for impact assessments.

Technical Corrections

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