Review of "*Uncertainty model for dual-Doppler retrievals of wind speed and wind direction*" by Vasiljevic et al

***General Comments***

This paper aims to present an analytical model that accounts for pointing uncertainty in addition to the classical LOS uncertainty in dual-Doppler lidar configurations. There are numerous assumptions that must be made to solve the equations analytically. The most critical are that winds are horizontally homogeneous, winds change in height according to a power-law, uncertainty is uncorrelated, the lidars use shallow elevation angles, and vertical velocities are minimal. These assumptions are incredibly limiting. A more appropriate approach may be using Monte Carlo simulations, as suggested by the author in their discussion. In the current form, this reviewer feels that the developed model does not make a significant contribution to the field. Therefore, I do not recommend publication.

***Specific Comments (in no particular order):***

- The assumptions that must be applied to derive the theoretical uncertainty *severely* limit the variety of cases for which the algorithm can be applied. It is evident that there is a specific use case for this algorithm rather than it being a generalized model for dual-doppler setups. If so, this use case should be indicated (e.g. for land based lidar setups monitoring offshore wind farms as stated in the introduction)
- The uncertainty of the LOS velocity is treated as constant, which is not necessarily true. In reality, this is a function of range and aerosol backscatter. In turn, this also violates the assumption that the uncertainty contributors are uncorrelated.
- There should be a comparison between previously used models (i.e. only accounting for LOS uncertainty) and this model to prove that it does in fact perform better and/or show magnitude of differences between the two models
- Figure 4-7 should be modified to not use a diverging colorbar for non-diverging fields. This leads to misleading results and/or difficult interpretation. Continuous fields (i.e. wind speed uncertainty) should use continuous colorbars. This is well established in literature (e.g. Stauffer et al. 2015).
- Figure 4 and others: Can you please comment on how to interpret the negative uncertainty that your figures show? Does this indicate that there is less uncertainty in negative areas or should I be looking at the magnitude of the uncertainty? Please clarify. If the latter, please plot the magnitude.

- The abstract is quite short and devoid of any discussion of limitations of the algorithm and any results or takeaways from this study. Please include these topics
- Page 2 Lines 21-22: What is an acceptable amount of error for wind energy applications?
- Page 9 Line 2: I think this is an important piece that is missing from this paper. There is really no proof that the examples given have uncertainty magnitudes that you indicate. Additionally, anyone wanting to use this model can't unless they first have the uncertainties of their system.
- Figure 4 and others: It's generally good practice to normalize things when talking about relative contributions. I think this would communicate more clearly that the elevation uncertainty is the largest contributor.
- Page 21 Lines 26-28: I think it would be good to also show a sensitivity study on the alpha parameter.
- Page 22 Lines 10-19: I think this is really the way this problem should be addressed. The authors themselves state that Monte Carlo simulations are mathematically less complex, simpler to implement, and able to handle more realistic flows.

***Technical Comments (in no particular order; representative, not comprehensive):***

- There are many spots where in text citations should be parenthetical citations (e.g. Page 1 Line 11), and vice versa. Please check to make sure all citations are formatted correctly; it is distracting to the reader otherwise.
- Page 1 Lines 18-19: Please provide citations for this
- For the derivation of the uncertainty model, a table of all the variables and their definitions would be useful for the reader
- Page 9 Line 16: "Second partial derivative" is confusing here. Just reference equation 19 instead
- Figure 5: The lower right panel does not fit the lower left panel
- Figure 6: Equation number in figure does not match the caption
- Figure 7: Equation number in figure does not match the caption
- Table 2 & 3: It took me a while to figure out what I was looking at here. It could use some reformatting
- Figure 8: Check units
- Page 22 Lines 3-5: This isn't true in general, but is for the specific configuration tested
- Page 22 Lines 7-9: This isn't true in my experience

***References***

Stauffer, R., G. J. Mayr, M. Dabernig, and A. Zeileis, 2015: Somewhere Over the Rainbow: How to Make Effective Use of Colors in Meteorological Visualizations. *Bull. Amer. Meteor. Soc.*, **96**, 203–216, https://doi.org/10.1175/BAMS-D-13-00155.1.