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Further Reply on RC1

Ryan Volz et al.

Author comment on "Four-dimensional mesospheric and lower thermospheric wind fields using Gaussian process regression on multistatic specular meteor radar observations" by Ryan Volz et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-40-AC7>, 2021

Thanks again for your thoughtful comments. Here are our comments on the remaining points:

3. (Justification for assuming Gaussian random processes) This question prompted us to think more about this assumption, so we thank you for that. Assuming normality imposes the minimal prior information about the wind processes within a second-order statistical framework since the Gaussian distribution has maximum entropy for a known mean and covariance. We will add this explicit justification to the revised manuscript.

4. (Generalized cross-validation) Generalized cross-validation is indeed one technique that could be used to further assess the validity of the wind estimates using just the data we already have. There is a good discussion of cross-validation in the context of GPR in Rasmussen and Williams (2006), section 5.4. We think this is a good area for future work (and will additionally note it in the revised manuscript), and the result would be a better understanding of the covariance hyperparameter values and the merit of different forms for the prior wind distributions. We leave it to future work because it addresses the topic of improving the model specification, and that area is large enough to merit its own paper(s) beyond the introduction of the technique that we provide here. Although such work would speak to validation, it still remains that comparison to a completely independent technique would go even further to give confidence in the GPR method.

6. (Figure clarity) Considering this and other reviewer and community comments, we will be simplifying the figures somewhat in the revised manuscript. Notably, we will be removing the vertical wind coloring from the horizontal wind streamline maps. We decided that the focus of these figures should be the horizontal winds, and including the additional color axis invites confusion and diverts focus. Additionally, we will be simplifying the bias panels in Figures 3 and 4 to remove the green shading and change the contour lines to depict the predictive variance values instead of dB improvement. This makes the comparison to the error variance more direct, while still giving the viewer the necessary information to focus on the more pertinent regions of the bias values.