The authors have significantly improved the manuscript and thoroughly addressed the review comments.

The only point of question is the development of Equation 11, which has been presented thoroughly and explicitly in the author response but has not been discussed in the manuscript. The reviewer suggests that Figure 3 (of amt-2021-233-author_response-version1.pdf) could be included in the paper. Further, a statement that there was no correlation between σ_{η} and the ambient temperature, which could hypothetically be a function of how hard the wind tunnel blower has to work to produce given global flow conditions, would remove the remote possibility that internal lidar noise is somehow a factor.

The reviewer also wonders if the results of the empirical analysis, which indicate that the white noise is due to shot noise AND global flow parameters, do already have some basis in literature. The global flow parameters will influence the de-correlation time of the lidar return. Specifically, turbulence level and scanning speed are known to influence de-correlation time [Lindelöw, 2008, Appendix B; others], and these two parameters could have relation to the energy dissipation rate and mean flow velocity, respectively, that were identified by the present authors as influencers of the noise magnitude (the mean flow velocity might be considered a surrogate for scan speed in the case of the static, off-axis scan configuration considered by the authors). In cw lidar, the de-correlation time affects the width of the Doppler spectra, which may affect the precision of the parameter estimation process used to determine the line-of-sight velocity.

References:

Lindelöw, P. Fiber Based Coherent Lidars for Remote Wind Sensing Ph. D. Diss. thesis Danish Technical University, 2008.