Review of the manuscript entitled "Evaluation of three lidar scanning strategies for turbulence measurements", by J.F. Newman, P.M. Klein, S. Wharton, A. Sathe, T.A. Bonin, P.B. Chilson, A. Muschinski.

This manuscript deals with the estimation of the covariance matrix of the wind velocity vector estimated through wind lidars. Three commercial systems are deployed using different scanning strategies. Turbulence wind lidar measurements are then compared with sonic anemometer data acquired from met-tower. A procedure for improving accuracy in the estimate of the variance is also proposed.

The results show generally a poor accuracy in the evaluation of the variance for the classical techniques, such as VAD and DBS, but also for the multiple beams techniques and with the application of the correction method. In extreme cases even unrealistic negative values of the variance are obtained.

Regarding the method to reduce DBS variance contamination in Sect. 2.4, very strong assumptions in the velocity signals are used, without providing physical motivations for those. For instance, I cannot find a physical justification for $\overline{v_{r1}dv} = \overline{v_{r3}dv} = \overline{v_{r1}dw} = \overline{v_{r3}dw}$. Why the vertical Reynolds stress should have same time-average with components acquired at different locations? ($\overline{v'_3 w'_3} = \overline{v'_3 w'_1} = \overline{v'_1 w'_3} = \overline{v'_1 w'_1}$). Another example is $\overline{dvdw} = 0$, then $\overline{dv^2} = \overline{dw^2}$?

I understand that these assumptions are needed to make the correction method applicable. However, in my opinion assumptions should be driven by the physics first. More comments on the physical meaning and expected consequences in the data retrieval due to these assumptions should be included.

Summarizing, this manuscript tackles a topic of high relevance for many fields, such as meteorology and wind energy. It is well written and describes accurately the assessment of the considered data retrieval techniques. More comments should be added for the formulation of the correction method.