Review of the manuscript amt-2023-153 entitled "Noise filtering options for conically scanning Doppler LiDAR measurements with low pulse accumulation" by E. Paschke and C. Detring.

This manuscript proposes revised filtering strategies of Doppler LiDAR data collected through the VAD technique with low pulse accumulation with the aim of retrieving wind turbulence statistics, such as TKE.

The manuscript begins with a roughly comprehensive Introduction, indicating clearly the work by Smalikho and Banakh (2017) as a reference for this work. In Sect. 2, the experimental setup is described followed by a characterization of typical noise encountered in LiDAR measurements. In Sect. 3, a review of some of the filtering techniques for LiDAR data is provided. Subsequently, Sect. 4 describes the filtering techniques proposed, which is followed by some applications of these filters in Sect. 5.

As a Doppler LiDAR researcher, I enjoyed reading this manuscript where the authors share their experience in filtering and processing VAD Doppler LiDAR data. I believe this manuscript will provide good guidelines in that realm, especially for younger researchers and practitioners. I find the filtering techniques proposed very reasonable and hopefully effective for producing noise-reduced LiDAR data. The main comment I have is about the length of the manuscript. I believe the manuscript can be significantly shortened by reducing lengthy, not strictly necessary discussions, and intermediate summaries and recaps provided throughout the manuscript. I think a shorter and more focused manuscript will enhance its impact. Please find below some details comments, which might help to revise the manuscript.

Detail Comments:

1. L28 – Please add some references for works related to the various turbulence parameters in order to provide sufficient information on the retrieval procedures adopted.
2. L54 – "… increased level of noise…" with respect to what condition? Reducing accumulation time? Please clarify.
3. L149 – Please clarify how these noise-free measurements are obtained at this stage.
4. L271 – "A more simpler", please revise this typo.
5. Sect. 3.2 – For the sake of completeness, it would be good if the authors could summarize the procedures for the retrieval of TKE from the VAD lidar data for both works SM2017 and KR1986.
6. L367-369 – You can briefly summarize the procedure used to retrieve TKE from the sonic anemometer.
7. L481 – I am not sure you introduced the acronym VV90D. Please verify.
8. Fig. 11 – I believe the reader does not have all the information needed to understand Fig. 11, e.g., the two-stage MAD filter. I would suggest removing this figure because the description provided in the text is already sufficient.
9. L492 – at this stage, it is not clear why the authors propose a shift of 90 deg. Please homogenize it with the text.
10. Fig. 12 – Letters [c] and [f] are missing in the caption
11. L631 – Please revise "on the one hand".

12. Eq. 9 – Can you please explain the origin of the coefficient 0.6745?
13. L744-749 – You can remove this summary of the previous section.