

Interactive comment on “A novel post-processing algorithm for Halo Doppler lidars” by Ville Vakkari et al.

Anonymous Referee #1

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The paper presents a new background correction method for the HALO Photonics Streamline Doppler lidar, but it can also be applied to other Doppler lidar systems. The paper is a well structured and the algorithm description is presented in detail. My overall impression of the paper is good and it should be published in AMT if the authors take into account the following points:

Major issues:

- The method is actually quite powerful and significantly lifts the performance of the Doppler lidar systems. It comes even close to the sensitivity of more powerful Raman lidar systems. In page 8 line 27 such collocated measurements with a Raman lidar are mentioned. It would be nice to a) show attenuated backscatter data of this Raman lidar system together with the improved signals in Fig. 8b. b) show profiles of att.

backscatter of Raman and Doppler lidars to prove that there is no remaining trend with height in the corrected data. Such an analysis would give additional value to the paper and help the reader to perceive the performance of this post-processing algorithm.

- Such work should reflect back on the next versions of the lidar systems and/or the on-board processing software. The algorithm should even be included in the data acquisition itself. Please comment if there are any plans for that.

- Is the software available somewhere? It would be really useful to point to a repository of any kind.

- Page 9 line 17: "With enhanced SNR, the instrumental contribution to radial velocity variance can be estimated with better accuracy". The method discussed in the paper is only applied to the SNR. How does improvement of radial velocity work in this context? Is the improvement maybe based on a better selection of radial velocity values? This is not fully clear, yet very interesting and should be demonstrated in the paper. Please provide plots of enhanced radial velocity together with Fig. 5, 7 or 8.

Minor issues:

- Would temperature stabilization of the Stream Line / Stream Line Pro instruments help to reduce noise?

- The authors present an algorithm that is applied to the evaluated profiles of SNR. Would it make sense to apply it to the raw spectra.

- Concerning the alternation of the emitter of lidar 146: Is it a fault of the individual system or is it found for all systems?

Technical issues:

- Table 1 could be condensed. Stream Line and Stream Line Pro seem to be identical and the only difference to the Stream Line XR seems to be pulse repetition rate and maximum range.

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- Figure 2: Using red and black both in (a) and (c) is a bit confusing in this context. Please use alternative colors in (c).

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