Comment on amt-2021-366

Anonymous Referee #2

Referee comment on "Retrieval improvements for the ALADIN Airborne Demonstrator in support of the Aeolus wind product validation" by Oliver Lux et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-366-RC2, 2021

General comments

The authors improve the ALADIN Airborne Demonstrator (A2D) Rayleigh and Mie wind data quality by modifications of the A2D wind retrieval algorithm. The authors also demonstrate that the retrieval modifications decrease the bias and random error of both Rayleigh and Mie channels when comparing the wind datasets from AVATARE and AVATARI campaigns against a collocated 2-μm coherent Doppler lidar. The comparison results between A2D Mie and Rayleigh wind data and the Aeolus measurements are of great importance to understand the performance of the reprocessed Aeolus L2B wind products (Baseline 2B10). The paper is well written and should be accepted after the following minor revisions.

Specific comments

- Line 73: "FPIs" should be revised to "Fabry–Pérot interferometers (FPIs)".
- Tables 1 and 2: Please define the number of A2D observations and the number of Aeolus observations. Are they the numbers of A2D and Aeolus wind profiles used for the comparisons? Is the number of Aeolus Rayleigh wind profiles the same as the number of Aeolus Mie wind profiles? Please clarify.
- Lines 166-267: In my opinion, the A2D technical details described in Section 3 can be condensed, because you described them in Lux et al. (2020a).
- Lines 215-219: The range gate settings are different from those described in Lux et al. (2020a). Please add some further explanations on that.
- Line 274: "detection chain offset (DCO)" should be revised to "DCO" because the DCO is already defined in Line 218.
- Figure 5e: "light green lines" should be revised to "thin black lines". Why no data is seen in altitude ranges of 1.5 to 2.0 and 3.0 to 3.5 km?
- Lines 356-359: I don't understand that it is sufficient to only consider the range gate #6. It should be better explained.

- Lines 359-362: Why do the authors only consider the position of spot B? If the sensitivities of two bandpass filters (A and B) are different, that affects determining the Doppler frequency shift in the Rayleigh channel. It should be better explained.
- Lines 407-408: Please define mean bias, standard deviation, and scaled mean absolute deviation. "MAD" should be revised to "mean absolute deviation (MAD)".
- Line 511: "mean absolute deviation (MAD)" should be revised to "MAD" because the MAD is already defined in Line 408.
- Section 4: Why do the authors present the results of comparison between Aeolus winds and ECMWF model background winds? Is it out of the scope of the paper? Please add some further explanations on that.

Technical corrections

- Line 685: sin(20) -> sin(20°)
- Line 692: sin(20) -> sin(20°)