Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., author comment AC2
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Reply on RC2

Shawn Wendell Wagner and David James Delene

Author comment on "Technique for comparison of backscatter coefficients derived from in situ cloud probe measurements with concurrent airborne lidar" by Shawn Wendell Wagner and David James Delene, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-87-AC2, 2022

The authors would like to thank the referee for taking the time to review the manuscript and make helpful suggestions toward improvements. Replies to the line specific comments are given below in italic after repeating the comment:

1. In line 244, what is "ni"? I think you refer to eta_i in equation (4). A similar issue appears in equation (5).

1. This is a formatting error where "n_i" should be "η_i". This will be updated within the text at lines 244 and 279.

2. For the upper right plot (B) in Figure 7, I think the median value is more reasonable than the mean value for the particle diameter measured by the ECP. Also, what is the definition of backscatter per second in Figure 5, the mean or median value?

2. While the median will be different than the mean of the spectrum and could be viewed as a more reasonable way to represent the spectrum, the merged spectrum data currently do not contain the spectrum diameter median; hence, additional software development would be necessary. The point of Figure 7b is to show relative difference in spectrum diameters between the four cases and to show when/if size changes occur during the time period. For this purpose, the mean works as well as the median. Additionally, Figure 7c shows the particles spectrums so the reader can interpret how the mean and medium are different. Hence, we respectfully feel that it is not important for the reader's understanding to present the spectrum median instead of the spectrum mean in Figure 7b.

The backscatter per second for the OID is the result of 20 kHz measurements aggregated to 5 Hz raw data. The mean of the 5 Hz raw data is then taken to match the 1 Hz ECP data, noted in lines 137 – 138.

3. The Figure 8 caption said the least square fit is the black line, but it is not black in Figure 8.

3. This is a formatting error where the "black" line should be labeled as "teal" (a change that was missed after the color scheme was updated to be more viewer friendly). This will be updated within the text at line 394.

4. Figure 10 needs some help. Two different color dots are heavily overlapped. Would it be possible to change to partly transparent to better distinguish cold and warm particles, or reduce the marker size? Furthermore, the figure with the same range for the x-axis and y-axis may be better to compare.

4. To increase the readability of Fig. 10, the size of the scatter points has been reduced, and a level of transparency has been added to the markers on both the top and bottom of the figure. The x-axes of the top and bottom plots have been made to match. The y-axes have been kept separate to maintain the one-to-one ratio of the top plot, as well as prevent a large amount of empty space for the bottom plot. These changes can be seen in an attached figure. For the revised manuscript as fit to the cold data will also be added.

5. The study points out that the biased low calculated backscattering from ECP. The backscattering is calculated by the measured effective diameter in this study. I am not very clear how the effective diameter is determined in the measurement. You also mentioned a "fast-circle diameter method". However, I did not find the related description in the supplement materials either. I think it is better to describe the measure and convert process more.

5. The diameter shown in the main text is found using the area-equivalent processing method, in which the total circular area of the pixels contained within an imaged particle are used to determine the associated diameter. The fast-circle processing method used in the supplemental material calculates the imaged particle diameter by encompassing the imaged particle entirely within a circle. The diameter of the resulting circle is assumed to be the diameter of the particle. Currently there is no generally agreed upon method for calculating the effective diameter, so we are presenting the two most accepted methods. Details regarding the methods for determining particle diameters will be added at lines 205 to 210 within the manuscript.

Please also note the supplement to this comment:
https://amt.copernicus.org/preprints/amt-2022-87/amt-2022-87-AC2-supplement.pdf