Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
https://doi.org/10.5194/amt-2021-281-RC2, 2021

Comment on amt-2021-281

Anonymous Referee #1

Referee comment on "Cloud microphysical measurements at a mountain observatory: comparison between shadowgraph imaging and phase Doppler interferometry" by Moein Mohammadi et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-281-RC2, 2021

The manuscript “Cloud microphysical measurements at a mountain observatory: comparison between shadowgraph imaging and phase Doppler interferometry” shows a study comparing two methods to size cloud droplets and explores the settings and methods of how these instruments should be used to yield matching results between the two methods. The authors used the VisiSize D30 as well as a Phase Doppler Interferometer during a mountaintop field campaign. These in-situ methods outside the laboratory can help to improve cloud measurements, as the reliability of various measurement techniques are uncertain and a thorough examination and evaluation of techniques and how to improve them is important for interpretation of collected data as well as the conducting of future measurements. In general, the manuscript is well written, and I recommend publication with minor revisions.

In the introduction of the coincidence filter, it would be good to explain why this effect happens. If I understand correctly, you assume that there was only one droplet, but it got somehow recorded twice by the instrument and you only keep the average size and velocity. Could actual coincidence also be a contributing factor, if two droplets (or fragments) pass the sample volume? Since other instruments have issues with recording two drops at a time, it would be worth noting.

For Figure 5, a size distribution of dNdlogd would be more useful. This way, it would be easy to see at which sizes the two instruments deviate. Since they seem to match in panel d, a dNdlogd size distribution would also show agreement there and show a deviation for smaller sizes. This would also show a comparison in the number concentration. Right now, it is not easy to see from panel a if the PDFs should be shifted or if one instrument detects less particles than the other; that only becomes obvious when considering panel d. This way, you could also include both methods for the PDI to show if those two have the same size distribution but shifted up/down (due to the different sample volume) or if they are skewed. It would help to also understand table 3. Probably the size distributions in Figure 5 only match for very large cutoff because D_min should not be a sharp cutoff of the PDI,

but it might miss smaller droplets gradually?

In Figure 10 especially in panel A the fit does not seem to be very good for large sizes. Why did you choose polynomial, not a different shape, and how many terms did you keep for the polynomial fit?

For general presentation I would suggest increasing the size of some figures for better readability and decrease the amount of white space between them, such as in figure 13. It looks very cramped, but there is plenty of white space to be used between the panels.

Equation 2: tau_Tot was not introduced.

Line 121-122: grammar (missing an “and” or something similar)

Line 316: typo: “because”