Atmospheric Measurement Techniques Discussions

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Comment on amt-2021-185

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Referee comment on "Post-flight analysis of detailed size distributions of warm cloud droplets, as determined in situ by cloud and aerosol spectrometers" by Sorin Nicolae Vâjâiac et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-185-RC2, 2021

The interest of the authors in using the particle by particle data (PbP) is a worthy objective; however, they have overlooked a number of critical factors in their methodology development that putss in question the usefulness of the smoothing technique until they address these factors. Before embarking on this development and writing of this manuscript they should have contacted us at Droplet Measurement Technologies and discussed what they planned to do. This would have possibly clarified for them why their approach needed to be reviewed and modified.

Secondly, they have overlooked a number of important publications that have already explored the issues that they discuss and addressed how to account for the ambiguities in size and scattering cross section. I have listed these below. Although several refer to the FSSP and not the CAS, the collection angles are similar andmeasurement principals are the same,

Thirdly, you have to take into account two important factors when carrying out the Mie calculations: 1) the droplets are being illuminated by a laser whose intensity cross section is not precisely uniform, which means that the high resolution oscillations are smoothed out (the authors state on line 157, "In older descriptions of the forward scattering spectrometers (originally used for aerosol sizing measurements, see Baumgardner et al., 1992) this aspect seemed to be overlooked and some smoothened versions of the FWSCS vs. diameter diagrams appeared to have been used.", but we were well aware of the oscillation but took into account the multimodal aspects of the FSSP lasers. And 2) the authors need a better understanding of how the scattering angles are obtained and understand that they are not a precise 4-13.5. Why? Because the scattering angles are determined by the distance of the measured droplet from the dump spot, the diameter of the dumpspot and the diameter of the aperture. This distance varies because the depth of field is of finite width. This means that the positioning of the peaks and valleys in the FWSCS shift slight, smearing out the fine detail that the authors show in their figures. This has to be taken into account.

Finally, although I would really like to see the type of fine detail in the size distributions that the authors show in Figs. 3 and 4, and attribute to natural microphysical features, I suggest that they look carefully where those peaks and valleys fall in the size distribution

and then take a careful look at their FWSCS diagrams and they will see that many, if not most, of these feature are a result of the Mie ambiguities. This is why they have to read Brenguier et al who actually uses those features to do quality checking of their FSSP.

In summary, withdraw the paper, read the literature and then consider a different approach to analyze the PBP measurements.

Line 67: The scattering cross section is not quasi-monotonic. It it oscillates.

References to read, study and cite

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