1 Report 2, Anonymous Referee 1, report 10 Feb 2023

Q1:Take out UAV from the abstract
A1: We would like to leave the sentence about UAV as it is, because it is showing our motivation for this and future studies. In this article we are not showing the results from the UAV, however, we already have been using OPC-N3 for UAV measurements. This is the first article and we are willing to publish in the future a continuation including the results from drones.

Q2: Ln 75; that needs a ref
A2: I suppose this is referring to the 76 line "Optical devices, such as the lidar or the celiometer, cannot penetrate thick fog to retrieve information about their vertical structure". We added a reference.

Q3: Eq 1 and 2; sigma is the extinction coeff
A3: Yes, it was a mistake, fixed.

Q4: DSD(r) show it as N(r). vDSD(r) change it to V(r).
A4: We use DSD(r) and vDSD(r) as it is used in other papers [1, 2]. Formulas for DSD(r) and vDSD(r) are the following:

$$DSD(r_b) = N_b \cdot (V_b \cdot \Delta r_b)^{-1}, \tag{1}$$

$$vDSD(r_b) = DSD(r_b) \cdot r_b^3, \tag{2}$$

where N_b number of droplets in a bin, V_b - volume of a bin, Δr_b width of the bin, r_b mean bin droplet radius.

Q5: 181-182; why you need these lines....
A5: Lines 180 till 185 describes the calculation of volume in ShadowGraph device. The sampled volume depends on the droplet size. The volume sampled is required i.e. for number concentration calculation.

Q6: Eq. 5; Vind,I; no need for "ind":
A6: Fixed.

Q7: Eq. 2; how come N(r) density is small compared to Visi N(r) but V(r) density is larger than V(r), please check it
A7: I suppose this question was about Fig.2, not Eq.2. I suppose the referee means DSD by N(r) and vDSD by V(r), which is confusing. Fig.2 shows the droplet size distribution DSD(r) (number concentration divided by the bin width) compared with the volume size distribution vDSD(r) (DSD multiplied by the mean radius of the bin to the third power). Apart from the last bin of OPC-N3, the DSD and vDSD from ShadowGraph are bigger than from OPC-N3

(the figure has different scales on the left and on the right axes). Fig.2 shows that presenting the data in the form of vDSD allows for better emphasizing the role of bigger droplet bins in the contribution to the LWC.

Q8: Why you think that Visi measurements correct?
A8: There are papers (Nowak et. al. 2021, Mohammadi et. al. 2022) validating VisiSize for atmospheric microphysic measurements of droplets (i.e., in cloud / fog).

Q9: Fig 4; Visi has 2xLWC compared to OPC but same reff; how that is possible?
A9:LWC is the amount of total liquid water. The r_{eff} of both devices is similar, however, the ViSize D30 is registering more droplets than OPC-N3, that is, why the LWC in ViSize is bigger than in OPC-N3.

Q10: Fig 5; how do you get sd? Based on man values or raw data?
A10: I do not understand what the referee meant by "sd". The Fig.5 show effective radius. Formula for r_{eff} is given by Eq. (6).

Q11: Fig 6; how did you get these means define them
A11: The following text was added to the manuscript. To calculate the mean radius r the following formula was used:

$$r = \left(\sum_{i=1}^{m} r_i \cdot N_i\right) \cdot \left(\sum_{i=1}^{m} N_i\right)^{-1}, \tag{3}$$

To calculate the mean surface radius r_S the following formula was used:

$$r_S = \left(\left(\sum_{i=1}^{m} r_i^2 \cdot N_i\right) \cdot \left(\sum_{i=1}^{m} N_i\right)^{-1}\right)^{1/2}, \tag{4}$$

To calculate the mean volume radius r_V the following formula was used:

$$r_V = \left(\left(\sum_{i=1}^{m} r_i^3 \cdot N_i\right) \cdot \left(\sum_{i=1}^{m} N_i\right)^{-1}\right)^{1/3}, \tag{5}$$

Q12: Fig7; why you used a lower threshold of 9.73 micron? Why don't plot also Nd and LWC time series?
A12: The Fig. 7 c) presents the LWC time series for cases of automatic fog detection. The process of automatic fog detection was described in Section 3.1. I will change the sentence 9.73 for a reference to Sec. 3.1, it will be more clear.

Q13: Fig A3; after correction results is worst than before, then why you do it?

A13: There is a difference in data between OPC-N3 and ShadowGraph. We tested if this inconsistency is due to RI assumed in OPC-N3. In a previous review, we were asked to add information on how the correction for the refractive index was carried out in the Appendix. The results of RI correction are discussed in the last point of Section 6. "Conclusion". Testing if RI correction is working provides information that probably Alphasense has a more sophisticated (than only based on Mie theory) built-in processing of the data while assigning it to the bin size.

References

[1] Zhouhang Li et al. "Effect of liquid viscosity on atomization in an internal-mixing twin-fluid atomizer". In: *Fuel* 103 (2013), pp. 486–494. ISSN: 0016-2361. DOI: 10.1016/j.fuel.2012.06.097.

[2] M. Mohammadi et al. "Cloud microphysical measurements at a mountain observatory: comparison between shadowgraph imaging and phase Doppler interferometry". In: *Atmospheric Measurement Techniques* 15.4 (2022), pp. 965–985. DOI: 10.5194/amt-15-965-2022.