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Comment on acp-2020-1238

Anonymous Referee #1

Referee comment on "Measurement report: The effect of aerosol chemical composition on light scattering due to the hygroscopic swelling effect" by Rongmin Ren et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-1238-RC2, 2021

Review of "Measurement report: The effect of aerosol chemical composition on light scattering due to the hygroscopic swelling effect" by Rongmin Ren et al.

This manuscript presents the results of an intensive field campaign of two week duration in an area south of Beijing. The manuscript focuses on the study of the effect of aerosol hygroscopicity in the aerosol light scattering coefficient. Despite the short measurement period, the data collected are interesting and the results are of scientific significance. Nevertheless, I have some minor comments that need to be clarify by the authors.

Line 78: Briefly describe the humidifying scheme by Carrico et al. (1998)

Line 80: Was the tandem nephelometer calibrated with ammonium sulphate or other salt of known hygroscopicity? This is highly recommended to assure that the system is functioning correctly and that the RH inside the nephelometer chamber is correct (see Burgos et al. (2019) and Fierz-Schmidhauser et al. 2010b).

Line 80: Were the nephelometers operated with or without the kalman filter option?

Line 90: The equation to calculate the dew point temperature is not the most common one. I looked in the references provided by the authors but Kuang et al. (2017) doesn't state which formula they use to calculate T dew point and the reference of Liu and Zhao (2016) is in Chinese. Please, use appropriate references for this formula.

Also, it would be interesting to see the comparison between RHin, RHoutlet and

RHcalculated.

Line 105: I really don't understand how the f(RH) is calculated. Why f(RH) is normalized? What is the reason behind this? Also, f(RH>40%) is averaged over what? Whole dataset, each scan? Then, in line 108 it is said that f(RH>40%) is 1. This is true for all the observations? Is it exactly 1? This calculation needs clarification.

Line 112: The absorption coefficient is measured at 7 wavelengths, the absorption coefficient at 520 nm is more appropriate than using the absorption coefficient at 880 nm and then convert it to 525 nm.

Eq 6: So, only f(RH=85%) is used to calculate gamma? If the frh measurements are performed at scanning RH it can be retrieved from a potential fit using the whole RH range, which will have less errors than using a single RH point (see Zieger et al. 2010, Titos et al., 2016).

Line 125: Include a reference to Zieger et al. 2010, who firstly introduced the hysteresis index.

Eq9: Actually, what it is here called g, it is usually referred as gamma.

Eq. 8: The RH range used to identify deliquesce is very narrow and can miss deliquescence processes occurring at slightly different RH. Maybe consider the procedure of Zieger et al.

Fig7: Why not consider all measured species, including NH4+, Cl- and BC? Is the organic mass fraction defined differently than in Figure 6?

Fig8: Use same color for WD from north (360º and 0º)

Line 220: Don't understand the reasoning, which marine aeosols do the authors refer to?

Line 245: Do the authors refer to an instrument artefact due to water depletion?

Line 260: It is not that in the previous studies the role of NO3- was not as important as in the present study. Quinn et al. (2005) didn't look at NO3-, their organic mass fraction was calculated using only SO42- as inorganic component. Why do the authors don't include NH4+? Previously they stated the importance of ammonia, but here it is not included. See the relationships obtained by Zieger et al. and Zhang et al.

Burgos, M., Andrews, E., Titos, G., Alados-Arboledas, L., Baltensperger, U., Day, D., Jefferson, A., Kalivitis, N., Mihalopoulos, N., Sherman, J., Sun, J., Weingartner, E., and Zieger, P.: A global view on the effect of water uptake on aerosol particle light scattering, Scientific Data, 6, https://doi.org/10.1038/s41597-019-0158-7, 2019.