

Interactive comment on “Vertical characteristics of aerosol hygroscopicity and impacts on optical properties over the North China Plain during winter” by Quan Liu et al.

Anonymous Referee #2

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The hygroscopic properties of aerosol in the polluted East Asia has been long studied from ground, but direct characterization of the vertical profile is very limited. This study provides vertical profiles of particle hygroscopicity under different meteorological conditions, by considering both particle size and chemical composition as well as evaluating the hygroscopic growth on optical properties. It provides insights in evaluating the cause of pollution especially under high moisture condition. The manuscript is generally well written. I recommend publication in ACP after addressing the following comments:

1. This work has both size and chemical composition measurements. The important

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message which could be delivered is the total CCN number concentration under certain SS%. It is better to highlight how much CCN could be in the highly polluted and less-polluted environment. 2. In the last section, discussion about CCN activation needs improvement, by including the discussions of CCN number concentration under different meteorological conditions. 3. It would be better to give some parameterizations of $f(\text{AOD})$ or $f(\text{RH})$.

Specific comments:

1. Show the location of AERONET site in Fig. 1.
2. In Table 1, the low PBLH corresponds with high RH?
3. Fig. 3 and Fig. 4, please describe the abbreviation of IRH, ρ_p , ρ_{lp} etc. in the caption.
4. Fig. 5, please provide the effective diameter in the figure.
5. The labels are too small for Fig. 7., the whole figure needs to be made larger.
6. line 316-318, how consistent with dry size?
7. Line 355-357, SS=1% can be deemed to be in convective system, a stratus may not reach as high as 1%, need to rewrite this part.
8. Line 409, framework.
9. the letter size in some figures are too small, please make them readable.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-1020>, 2019.

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