

Interactive comment on “Quantification of black carbon mixing state from traffic: implications for aerosol optical properties” by M. D. Willis et al.

Anonymous Referee #2

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The paper aims to assess the black carbon mixing state near traffic sources and its impacts on the aerosol optical properties. Based on SP-AMS measurements, two types of BC-containing particles were found near the traffic emission point, in which BC and HOA takes respectively the dominant mass fraction. The simulation with PartMC-MOSAIC suggests that assuming a uniform mixing state near traffic sources may result in an underestimate in SSA of about 0.1. This message is quite important since uniform mixing states of BC were usually assumed in previous studies on aerosol optical properties and DRF. The paper is well written. Therefore I recommend the final publication of this paper on ACP.

Minor comments:

1. I like the style of this paper which is short and straightforward. But sometimes it
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is also inconvenient to always try to find things in supplement. Maybe the author can consider moving some important contents back to the main text.

2. Fig. 5: It seems the SSA derived with PASS-3 measurement is with very large uncertainty.

3. In the box model simulation a constant mixing height was assumed. There are studies based on PartMC-MOSAIC simulation suggest the diurnal evolution of mixing layer plays a very important role in the variation of aerosol mixing state (e.g. Liu et al., 2011). I am wondering if you will have largely different result if the variation of mixing layer is switched on.

4. Fig. 6: Are the calculated aerosol optical properties at dry state or ambient state (70% RH in your model)? I think it would be more interesting to see the results for ambient condition.

P33559 L18-20: Overestimations in absorption efficiency would result in underestimates of SSA.

P33560 L7: please define “rBC” here

P33561 L10: were used

P33566 L3: Fig. 4e and f

P33582 L1: measurement-constrained

Figures: both m^{-3} and /cm^3 are used in axis label. Please use the same style throughout the paper.

Reference

Liu, P. F., Zhao, C. S., Göbel, T., Hallbauer, E., Nowak, A., Ran, L., Xu, W. Y., Deng, Z. Z., Ma, N., Mildenerberger, K., Henning, S., Stratmann, F., and Wiedensohler, A.: Hygroscopic properties of aerosol particles at high relative humidity and their diurnal varia-

tions in the North China Plain, *Atmos. Chem. Phys.*, 11, 3479-3494, doi:10.5194/acp-11-3479-2011, 2011.

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