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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization and source apportionment of aerosol light scattering in a typical polluted city in Yangtze River Delta, China" *by* Dong Chen et al.

Anonymous Referee #2

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The current manuscript presents a comprehensive study of the influential factors and source apportionment of aerosol light scattering at three sites in Nanjing, representative for suburban (NJU), urban (PAES) and industrial areas (NUIST) respectively. The data obtained in this work show interesting details on the linkage between chemistry composition and light scattering of aerosols, and help better understanding the effects of various sources on visibility degradation at the city scale. Overall I think the work provides reasonable analysis and the paper is clearly written. Before it can be published in Atmospheric Chemistry and Physics, however, I have some concerns that should be further addressed, and minor revisions are accordingly suggested as below. 1. In line 130, QA/QC procedures of aerosol sampling process are missed in this

manuscript, which are important for a scientific paper presenting the first-hand data. For example, the MOUDI sampler could be blocked during heavy pollution conditions, and the collected samples might not be evenly distributed. This phenomenon would affect the chemical analysis, particularly for OC and EC (choice of spots). How did the authors treat such kind of problems or estimate the uncertainty from sampling? 2. In Line 136, were field blanks obtained during the sampling campaigns? And, why were the sampling periods different at the three sites? Similarly, in Line 128, why was the sampling size at NJU larger than another two sites? The sampling strategy should be described more. 3. In Line 145, Sunset analyzer was able to measure thermal EC and OC, and optical EC and OC. The author should clarify it carefully in the paper. Why choose them for the analysis? 4. In Line 183, what software did authors use to run the multiple linear regression? If this model has been developed or used in other studies, the references should be provided. 5. In Line 190, considering the light absorption of methanol soluble organic carbon (MSOC), the optimization of the US IMPROVE algorithm is quite interesting. How did the authors estimate the MSOC concentrations in fine and large size modes? 6. In Line 190, why did the authors only include those eight variables in this equation? How about other species like coarse particles, sea salt, and soil dust? 7. In Line 214, the authors need to explain the special reason why they applied PMF model in their analysis. 8. In Line 292, the author stated that "the sum of NO3-, SO42- and OC for the heavily polluted period was 10.7 and 2.9 times greater than those for the lightly polluted and clean periods". Something seems wrong here. In which period was the concentration higher, lightly polluted or clean period? From Table 1, moreover, it seems that SNA was elevated more than OC in the heavily polluted period compared to the clean days. Any reason for this difference? 9. The authors did not clearly explain the data of which site were used in Section 3.4. If it is based on the data of the three sites, the assumption in Section 3.4 that chemical particles were externally mixed will cause large uncertainty in the calculation of scattering coefficient at NUIST because the internal mixt was an important particle mixing state at NUIST (Figure 3c). 10. In Line 534, in general, results generated from PMF model could be

questionable if less than 100 samples were used in the model. How did the authors consider this problem?

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