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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characteristics of aerosol pollution during heavy haze events in Suzhou, China" *by* M. Tian et al.

Anonymous Referee #3

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Reviewer's comments for "Characteristics of aerosol pollution during heavy haze events in Suzhou, China" by Tian et al.

The manuscript by Tian et al. presented a field study for PM2.5 mass concentration, PM2.5 chemical composition, and associated gaseous precursors during haze events in a major Chinese city located in the Yangtze River Delta. Like many other studies in China, this work highlighted the large contributions of secondary aerosol species in PM2.5. Source regions were analyzed based on the back trajectory calculations.

The new perspective (in my opinion) this paper brought to us is the results on the main contributors of the light extinction in PM2.5 components. These results are interesting and potentially have policy implications, because light extinction is directly linked to the visibility, which is one of the major public concerns in China. In the current

manuscript, this assessment was based on the measured concentrations of chemical species weighted by the mass-extinction coefficients derived from the revised IMPROVE algorithm. The authors identified OM, sulfate, and nitrate as the major contributors of visibility impairment. However, I do agree with reviewer #1 that such analysis was not convincing without appropriate comparisons with other measurements. I would suggest the authors to strengthen this analysis before this paper can be published in ACP, since it seems to be crucial for the main conclusions.

A possible way to do this can be including a more comprehensive comparison between the light extinction reconstructed from chemical species with that derived from the visibility. A previous study (Chen et al. ACP, 2012) in North China has shown that the visibility-derived ambient light extinction can be well reconstructed by an optical model with measured number-size distribution, hygroscopicity, and RH. For the revision, a scatter plot and/or a time series plot could be included for comparison of the light extinction coefficients derived from both methods. Uncertainties should also be included. In the case of poor agreement, several hypotheses can be tested, including: 1) Coefficients developed based the IMPROVE data are not suitable for the aerosol populations in China, e.g., due to the differences in size distributions. In this case better parameterizations are needed for the haze over China. 2) The RH (or other key parameters) measurement may not be accurate; e.g., Fig. 2 shows severe haze events are associated with high RH ($\sim$90%), where the RH sensor may have a large error. In this case the assessment can be biased for contributions between hygroscopic inorganic species and hydrophobic OM. Some caveats should be discussed.

Another suggestion is that the authors can also present the contributions of different species to PM2.5 mass concentration in addition to light extinction (e.g., in Fig. 5 and 9, Table 1). This analysis will be based on measured variables and thus less ambiguous. Such results can be useful in the context of aerosol health effect, which is another major concern related to the air pollution.

Reference: Chen, J., Zhao, C. S., Ma, N., Liu, P. F., Göbel, T., Hallbauer, E., Deng,

Z. Z., Ran, L., Xu, W. Y., Liang, Z., Liu, H. J., Yan, P., Zhou, X. J., and Wiedensohler, A.: A parameterization of low visibilities for hazy days in the North China Plain, Atmos. Chem. Phys., 12, 4935-4950, doi:10.5194/acp-12-4935-2012, 2012.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 33407, 2015.