

Interactive comment on “A case study of the highly time-resolved evolution of aerosol chemical and optical properties in urban Shanghai, China” by Y. Huang et al.

Anonymous Referee #3

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General comments: In this manuscript high-time resolution chemical and optical properties of aerosols were studied in the urban area of Shanghai, China. This information was useful to obtain the particle properties in Shanghai. The data collected in this study was limited, only 3-day data, but since there were no earlier studies in this region, these measurements provided the basic data set of aerosol properties in Shanghai. However, the data analysis in this study was not deep enough. Only correlations and comparisons were performed, which yielded little on the relationship between aerosol chemical and optical properties. New findings were adequately mentioned in the conclusions of this manuscript. Some statements were not persuasive and seemed to conflict with each other. Many corrections and clarifications were necessary to im-

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prove the manuscript. I suggest that the manuscript should be substantially revised before publishing in ACP. Specific comments: *Introduction*: There have been many studies to investigate the relationship between aerosol chemical and optical properties, such as IMPROVE, and there have also some studies in Beijing and PRD region. However, those previous studies were not included in the introduction part. *Page 31958, Line 10-15*. Besides field study there are many important lab studies on the optical properties of soot aging. The introduction should give a complete picture of this area, from fieldwork to the lab work. In addition, many of the previous studies have showed that aged soot can effectively enhance aerosol optical properties. Those aspects should be clarified in this introduction. Slowik et al. *Aerosol Sci. Technol.* 2007, 41, 734 Qiu et al. *Sci. Technol.* 2012, 46, 4474-4480 Xue et al., *Environ. Sci. Technol.* 43, 2787–2792 (2009). Pagels et al., *Aerosol Sci. Tech.* 43, 629–640 (2009) Khalizov et al., *J. Phys. Chem.* 113, 1066–1074 (2009). Xue et al., *Phys. Chem. Chem. Phys.* 11, 7865-7875, DOI:10.1039/b700001a (2009). Khalizov et al., *J. Geophys. Res.* 114, D05208, doi:10.1029/2008JD010595 (2009). *Page 31958, Line 18*: severe air pollution? Use numbers, like PM concentration increase, energy consumption increase, vehicle use increase. *Page 31958, Line 23-25*. Summarize the results of previous studies. *Page 31959, Line 1-7*. This part should be included in the experiment part, not here. *Page 31959, Line 10-18*. Rewrite this part. Summarize your work: what did you want to do, and how did you do? *Page 31961, Line 15*. 0.8 inch? Or unit missing? *Page 31963, Line 2*. 6 m long stainless steel pipe. Did you calculate the particle loss in the sampling inlet, since 6 m inlet could result in a particle loss. *Page 31963, Line 10*. Where was the Shanghai Meteorological Bureau? How far was it from the sampling site? Can this data represent the condition at the sampling site? *Page 31963, Line 19*. From Fig. 1, except 14th Oct. I don't think the wind data were consistent with back trajectories. In addition It made no sense to use three figures to present back trajectories in three days, instead of three periods. *Page 31963, Line 20*. “almost the entire day...” avoid using this ambiguous expression. There were many this kinds of expressions in the manuscript. *Page 31964, Line 16*: I am

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confused by the classification of the three periods. I don't think the period 2 should be from 23:00, 13 Oct. to 10:00 15 Oct. From back trajectories, the air mass origin definitely changed at some time during 14 Oct. – Page 31964, Line 25. Was there any overlap between ECOC particle and OC particle? Describe the criteria how to define the particle type. – Page 31966, Line 13-15. The new particle formation and dust event were not directly measured, but in the statement from previous part, the author made an affirmative statement about this. Also, provide a definition of new particle formation in the present study (i.e., Zhang, *Science* 328, doi:10.1126/science.1189732, 1366-1367, 2010; *Chem. Rev.* 112, 1957-2011, 2012). – Page 31966, Line 19. If it was from local origin, it should have spikes on the contrary. – Page 31967, Line 20. This expression would be misleading since the ratio of sulfate and nitrate to ammonium was called particle acidity, but it is not. Personally I don't like this method to estimate particle acidity and it cannot reflect particle acidity very well. However, it was really difficult to decide particle acidity. The author should clarify the uncertainty of this method. For my knowledge, the thermo dynamic model ISSORPIA was a better way to calculate acidity. Even if the authors did not use this to calculate acidity and re-analysis, this should be pointed out. Nenes, A. et. al, *Aquat. Geochem.* 1998, 4 (1), 123–152. Guo, S. et. al, *Environ. Sci. Technol.*, 2012, 46(18), 9846-9853 – Page 31968, Line 7. It made no sense to use average size, because it cannot indicate particle distribution. Usually mass medium aerodynamic diameter (MMAD) or medium aerodynamic diameter (MAD) were used to describe the particle size distribution – Page 31968, Line 25. During period 3, if there was dust, the acidity should be low. This result conflicted with your previous statement. In addition, particles from regional transport should be more aged, and have higher acidity than the local particles. There were also a few other conflicted results between particle origin and acidity. – Page 31969, Line 25. This explanation was not persuasive. The SSA depended on the ratio of scattering to extinction. – Part 3.3.1: The authors used two paragraphs to discuss the relationship between PM1 and optical properties, but there was no clear point or new findings here. – Part 3.3.2: Re-define periods really confused some readers. This

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part also compared some trends and showed some correlation that lacked integrated and quantitative analysis of the particle chemical and optical properties. This is really confusing and made it difficult to figure out the points of this part. – Conclusion: it was more like a summary, not a conclusion. There were too few new findings here.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 12, 31955, 2012.

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