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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Absorption coefficient of urban aerosol in Nanjing, west Yangtze River Delta of China" *by* B. L. Zhuang et al.

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Response to reviewer's comment C4745

The paper report two years of aerosol absorption coefficient (AAC) measurement in urban Nanjing of China. Data correction of Aethalometer measurement is often overlooked in many existing study in China. It's glad to see that three correction schemes are applied and compared in this study for reporting AAC from Aethalometer measurement. The paper is well written and the measurements are reasonable. The reviewer think the paper can be published on ACP if following comments are addressed. Dear Reviewer, Thank you very much for reviewing the manuscript and providing us the constructive comments and suggestions on our study. With respect to your comments,

necessary revisions of the paper have been made. We will response to your comments carefully point by point; details of the revisions can be referred to the revised version of the manuscript.

Major comments: 1) Although the annual AAC of 2012 is comparable to 2013, the seasonal distribution of AAC is quite different. Summer AAC in 2012 is higher than 2013, but winter AAC in 2012 is lower than 2013. What's the cause of the different seasonal AAC distribution between two years? Is it associated with meteorology condition or emission?

R: Thank you for your question. High levels of summer AAC in 2012 is associated with the biomass burning in the regions around Nanjing, as discussed in Zhuang et al. (2014). High levels of AAC in winter 2013 might possibly result from large scale regional pollution episodes over East and North China which might be associated with meteorology conditions. Studies on the reasons leading to high BC pollutions (high levels of AAC) in Nanjing during the sampling period (Figure 11) would be carried out and reported in detailed in further publication.

References: Zhuang, B. L., Wang, T. J., Liu, J., Li, S., Xie, M., Yang, X. Q., Fu, C. B., Sun, J. N., Yin, C. Q., Liao, J. B., Zhu, J. L., and Zhang, Y.: Continuous measurement of black carbon aerosol in urban Nanjing of Yangtze River Delta, China, Atmos. Environ., 89, 415–424, 2014.

2) For the clusters analysis of back trajectories, similar clusters can be grouped together. For example, 2 & 4 in 2012 and 1 & 4 in 2013.

R: Thank you for your suggestion. In our study, recommended clusters were used based on 30 % criterion in Hysplit model. Although some clusters are similar to each other, difference exists. Additionally, AACs and AAEs show different variations to some extent with different clusters. For example, the transportation speed of air masses in Cluster 4 in 2012 (Figure 8a) is much larger than that in Cluster 2, implying that the source of air masses in Cluster 4 are farther away probably. Hence, aerosols in these air masses have smaller sizes as shown in Figure 9c (Larger AAE values). The recommended clusters here can provide readers more details and they are reasonable and necessary to some extent.

3) Regarding to the MAE shown in Figure 10a, what instruments are used for absorption coefficient and BC mass concentration measurement respectively? If the BC mass used here is also from Aethalometer, the calculated MAE become circular reference and meaningless.

R: Thank you for your question. BC mass concentration from channel 880 nm of AE-31 has the largest representation of the real BC mass (to minimize the interference from light absorbing organic carbon). Additionally, Wu et al. (2009) suggested that linear correlation coefficient between BC from AE-31 at channel 880 nm and BC from Carusso is about 0.97 (R2=0.94) in China, implying that BC mass at channel 880 from AE-31 are reasonable and could be represented real BC mass in the atmosphere to some extent. Thus, BC concentration at channel 880 nm was used to calculate the specific absorption coefficient at 532 nm as following: MAE532nm=AAC532nm in SC2006/BC880nm, because there were no concomitant or concurrent BC mass measurements by other instruments at our site.

References: Wu, D., Mao, J. T., Deng, X. J., Tie, X. X., Zhang, Y. H., Zeng, L. M., Li, F., Tan, H. B., Bi, X. Y., Huang, X. Y., Chen, J., and Deng, T.: Black carbon aerosols and their radiative properties in the Pearl River Delta region, Sci. China Ser. D, 52, 1152–1163, doi:10.1007/s11430-009-0115-y, 2009.

4) The author conclude that Schmid correction is more reasonable base on the comparison between average AAE from different correction schemes and average AAE retrieved from sun photometer measurement. The referee suggest that a scatter plot between hourly Aethalometer AAE660;470 and CE-318 AAE675;440 would be more convincing than a single average AAE comparison. The slope and the correlation coefficient can be used to evaluate the degree of agreement between AAE from different

correction schemes and AAE from sun photometer.

R: Thank you for your comments. Differences between AAE in SC2006 and the one in WC2003 are derived from the different C values (scattering effects) at different wavelength in these two corrected methods. C value was set to constant in WC2003 while it was varied with wavelength in SC2006. However, all these values are time-independent, implying that temporal variations of AAE in WC2003 are consistent with the ones in SC2006 although they have different values. And it could be expected that relationship between SC2006-AAE and CE318-AAE is similar to that between WC2003-AAE and CE318-AAE. Therefore, a single average AAE comparison was carried out.

5) Figure 12 can be removed or put in supplemental materials since this information is not directly associated with the main topic of this paper. The reason of having dynamic cycle time for filter tape advancing in Aethalometer is to avoid overloading of the sampling spot on the filter. When the ATN reach a threshold (adjustable by user in the range of 75 ËIJ 125), the filter tape will advance to the next position. In other words, when the ambient AAC is higher, ATN takes shorter time to reach threshold. As a result, the interval is shorter when AAC is high. So this phenomenon is just a common characteristic of instrument itself and has nothing to do with the sampling site.

R: Thank you for your suggestion. Fig. 12 will be deleted in revised manuscript. The last paragraph of the Results section (line 12 -22 in Page 19 in discussion typeset manuscript) was deleted, so does Figure 12 in Page 39 in discussion typeset manuscript.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/15/C8921/2015/acpd-15-C8921-2015-supplement.zip

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 16175, 2015.