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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size distribution and mixing state of black carbon particles during a heavy air pollution episode in Shanghai" *by* X. Gong et al.

Anonymous Referee #3

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This study presents a short period in-situ measurement of black carbon in Shanghai urban area. Both Single Particle Aerosol Mass Spectrometer (SPAMS) and Particle Soot Photometer (SP2) were employed to get comprehensive information of BC-containing particles, including the number size distribution of BC-containing particles and BC cores, chemical composition of BC-containing particles, and the core-size and coating thickness of BC-containing particles. The combination of SPAMS and SP2 provides a perfect tool to investigate the aging process of BC particles in the atmosphere. This study is probably the first one conducting such a measurement in heavy polluted megacities in China. Although there is not detailed discussion on the aging of BC particles from different sources, it provides some interesting results about the mixing state

of BC in heavy polluted atmosphere. I therefore recommend the final publication of this study on ACP.

Specific comments:

Abstract: The abstract should be condensed. It is not necessary to list all the numbers like the PM concentrations in the first paragraph and the number fraction of the 7 groups in the second paragraph.

Introduction: I suggest the author to better motivate the study. Some similar studies in other big cities are listed in the 5th paragraph of section 1. What information is still missing or not clear? What may this study contribute to our knowledge?

Sect. 2.1.3: To derive the optical diameter of a particle, did you assume a core-shell particle structure in the Mie calculation? As mentioned in this paragraph, an effective negative coating thickness will be yielded if small amount of BC stays on the surface of a big particle. I think in atmosphere, the structure of most BC-containing particles is neither ideally core-shell nor BC staying on surface, but something in between (e.g. BC coated with other species but not at the center). Do you have any estimate about the possible influence of this effect on the ACT yielded with your method?

Sect. 3.2 para. 2: These comparisons are not necessary. I think it does not make too much sense to compare your 5-day measurement during extreme pollution episode with other results with might be yielded in different seasons, pollution situations, and types of site. Such a comparison may give the audience a wrong impression.

Sect. 3.3: Some of the groups (e.g. KBC and NaKBC) have similar mass spectra and are attributed to similar sources, and are not really distinguished in the follow sections. Please consider reducing the number of groups. Or keep the classification as it is in this section, and combine some of them in the later discussion (fig. 4 and 5).

Sect. 3.4.2: The author mentioned that BCOC-NOx particles are much older and are supposed to have larger size (P35396L19). But in Fig. 5B we can see the ratio of

BCOC-NOx particle number to BCOC-SOx particle number is even higher in condensation mode. Do you have any explanation on this?

Sect. 3.4.2: Fig. 6 only shows the information of traffic-emitted BC-containing particles. I think it is not enough to support the conclusion of “Reductions in the emissions of gaseous precursors, such as NO2 in the urban area, are critical for remediation of the severe urban haze pollution in China.”.

P35387L4: it is better to use rBC here and after for SP2 measurement

P35385L26: absorption cross section

P35390L17: please give the information of manufactory of SPAMS

P35391L12: please give the full name of Dva

P35396L13: I would not say BBBC particles dominate the droplet mode if they take less than 30% number.

P35398L26: I did not see any “significant incensement”. Maybe use “a relatively high level” instead.

Figures: it is better to use the same style of unit as in the text, e.g. ugm-3 instead of ug/m3.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 35383, 2015.