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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Light absorption of brown carbon in eastern China based on 3-year multi-wavelength aerosol optical property observations at the SORPES station and an improved Absorption Ångstrom exponent segregation method" *by* Jiaping Wang et al.

Anonymous Referee #2

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This manuscript improved the previous absorption angstrom exponent segregation method based on Mie-theory simulation and measurement of multi-wavelength aerosol light absorption, by calculating AAEBC at each time step instead of assuming a constant. With the improved method, this study estimated light absorption of BrC and its relative contributions to total light absorption in Yangtze River Delta, China, investigated its seasonal and diurnal variations, and pointed out its dominant sources. However, there are still some major concerns about the technique parts, especially the

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uncertainties of the method, which should be considered by the authors before the manuscript could be published in ACP.

General Comments The authors tried to make improvement of aetholometer model method. However, the parameters used here, such as volume, densities and sizes of OC and EC, OM/OC ratios, and morphology and mixing state/compositions of BC particles, which are critical inputs for Mie-theory simulations, were not obtained from direct measurements, but inferred from indirect calculations based on some assumptions. Therefore, my biggest concern is about the uncertainties related to these assumptions and calculations. It would be better to add a part to notify the uncertainties and estimate the uncertainties if possible.

Specific comments 1) Line 28 on page 1: It is better to defined “babs_BrC” as “light absorption coefficient of BrC”, with unit as Mm-1. 2) Line 26-27 on page 4 and line 1-6 on Page 5: There are still some brown carbon related studies conducted in China especially in north China such as in Beijing, although these studies were not based on AAE method. 3) Line 10 on page 6: It is still not clear, why 520 nm but not other wavelength was chosen for the following calculations. 4) Line 13 on page 6: As mentioned in the manuscript, some factors might influence the accuracy of the Aethalometer measurement, such as relative humidity especially when the air was not dried prior to sampling. So is RH considered when the authors did the correction for the Aethalometer observation data? 5) Line 24 on page 6: Please add references for the laser absorbance technique for pyrolytically generated carbon correction, or at least give a brief introduction here. 6) Line 26-28 on page 6: Compositions and properties of fine particulate matter might be more complicated in China than other regions. However, the references Aiken et al., 2008 and Pitchford t al., 2007 were both conducted outside China several years ago. So, is it possible to cite some recent literatures especially those conducted in China? And please add a reference for density of EC (1.8 g/cm3). 7) Line 8 on page 7: Please clarify the potential influence of dust, another important light absorber in the atmosphere, and explain how to exclude it. 8) Eq 2: How about the

influence of other light-absorbing substances, and the coating thickness/composition of black carbon? 9) Line 4-5 on page 8: It would be better to point out major factors which might influence the AAE values or light absorption properties of BC, before the sentence “Therefore, it is essential to firstly evaluate . . ..” 10) Line 8 on page 10: The current display format of Figure 3 is not quite powerful for the statement of “especially in less polluted periods”, as many negative values also occurred in higher polluted days, with even lower negative values. 11) The findings of this study were consistent with previous studies. It is better to refer to or compared with more previous studies. For example, some studies have also pointed out that coal combustion was one of the major sources of brown carbon in north China in winter.

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