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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Light absorption of brown carbon aerosol in the PRD region of China" *by* J.-F. Yuan et al.

Anonymous Referee #2

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A three-wavelength photo-acoustic soot spectrometer, an aerosol mass spectrometer, and an aerosol chemical speciation monitor were used to measure and show the relationship between the relative abundance of organic aerosol to black carbon and its relationship to the Absorption Angstrom Exponent (AAE) in ambient samples collected in urban and rural areas in the Pearl River Delta region of China. Since the AAE is widely used in attributing the light absorption of brown carbon at shorter wavelengths, the method was improved by statistical analysis and applied to the collected data. The findings from this study are relevant to the readers of ACP as well as the air pollution and aerosol communities. The manuscript includes enough discussions of the limitations and implications of the study. Therefore, I recommend publication of this manuscript upon consideration of the suggested revisions listed below.

General Comments - Be consistent in the use of brown carbon or BrC, and Absorption Angstrom Exponent or AAE. - Better tie results with what they mean. It is difficult to follow when several numbers are listed in a long sequence. - Choose words that are more descriptive of what is being said, or follow up with a brief explanation. Some choices are vague and leave the reader to wonder in what context they are being applied, or are being related to. Example: levels, comparatively, and convenient. - Remove words that do not add any significance to the text. - Be consistent with tenses. - Check for the proper use of "in", "by", "on", etc. - Cross-referencing different sections within the text makes it for a difficult read. Specific Comments (by line) - 55, Unclear when said that, " BrC aerosol could contribute more than 65 and 15% light absorption at 370 nm" - 60, Related to line 45, but too far apart. - 63, The authors could expand on why East Asia in one the five regions of atmospheric brown clouds. - 75, What is it meant by universal? - 110, What type of "little local emission" - 117, It is stated that tunnel experiments were performed three times. Does that mean measurements were done three times inside each tunnel? I only see two tunnels, the Tanglanshan and the Jiuweiling tunnel. Is there another one? Please reword this sentence. - 128, Rearrange order of the sentence to better describe why biomass burning simulation experiments were done in the combustion laboratory. Although it is known that biomass burning is a great source of BrC, as it is, it appears that biomass burning experiments were done without a purpose. - 138,139, Why was the water boiling test protocol developed by the University of California used? - 152, Please clarify how the data was processed and how AMS data was related to PASS-3 data. Remove "in the later data analysis and discussion." - 163, Expand on how the ACSM is a convenient version of the HR-ToF-AMS. - 169-171, What are satisfied results. Please also reword this sentence. - 178, Table 1. I see how the calibration adds to the validity of the data, but I would consider adding such information to a supplement and not to the main text. - 224, Please explain unfavorable meteorological conditions in PRD. - 226, Please consider a better location to compare the data with. I do not see how Denver, CO relates to the PRD region. - 231, Reword this sentence – "suffering from the severe polluted outflow air from its

northeastern the Guangzhou..." - 233, Refer to HS again, if this is the place you are still talking about. - 246, Clarify if dust events happened. It is mentioned that there were no dust events, but the authors follow to say that they scarcely happened. - Fig. 1, Explain why there are gaps in the data in Urban-winter (January) and Urban-fall (September). - 260 - 271, Seems to be redundant information. The information was already stated previously. - 299, This is the third time it has been stated that the assumption of AAE = 1 for BC is not reasonable. I believe this point has been made. - 328-344, Please reword. - 350-359, Data is too sporadic. It is difficult to follow what set of data goes with what site or wavelength. - 363, What is it meant by level?

Technical Comments - Figure 2, Any reason why when r_org/bc reach 2 the AAE's drop for all cases? - How many points were used for the figures? - Table 4, Please specify the burning modes for all biomass types. My understanding from looking at the table is that only the modes for Peanut stalk and Short straw are specified. Perhaps arranging the AAE's in ascending or descending order would make it easier for the reader to compare results.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 28453, 2015.