

Interactive comment on “Measuring morphology and density of internally mixed black carbon with SP2 and VTDMA: new insight to absorption enhancement of black carbon in the atmosphere” by Y. X. Zhang et al.

Anonymous Referee #2

Received and published: 10 January 2016

The authors present a new measurement system for in-situ measurements of the morphology and effective density of internal mixed black carbon cores. They demonstrated the utility of this system through an intensive field study in North China in 2013, quantified the evolution of morphology and density of ambient In-BC cores during aging process and investigated the absorption enhancement of ambient In-BC aerosols taking core morphology and density into account. The material presented in the manuscript is within the scope of AMT. It includes appropriate references to previous work on this topic and the methods and results sections are, for the most part, described in ade-

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quate detail. Generally speaking, this work presents a unique new approach to improve the calculation of mixing state and optical properties of ambient In-BC particles, and these methods and observations represent sufficient new material to justify publication. Therefore I recommend this manuscript to be considered for publication in AMT after some minor revisions.

Major comments:

The manuscript should provide more detailed description of the measurement system, including information regarding the system setup (including manufacture and model information), instrument speciation (for SP2 and VDTMA, referred to previous publications), and calibration procedures. Though thermodenuders are fairly common in the aerosol community a general reference to the technique is probably still needed here. As an AMT publication, ideally even readers unfamiliar with these instruments would be able to reproduce exactly the method used in this study from the information provided in the manuscript. It will be helpful if the measurement system section also provides more information regarding the experimental uncertainties and a comparison to those previously applied techniques.

A few more points should be addressed:

- 1) Page 12030 line 15-19: Authors should emphasis that at this polluted continental site, in the sub micrometer range, non-volatile fraction may consist of mainly BC. It should be mentioned here the low-volatile organic coatings may cause biases in VT-DMA measurement of in-BC core diameter.
- 2) Page 12031 line 17-20: More detail descriptions of the Xianghe Atmospheric Observatory should be given here. Is it an urban site or polluted regional back ground site? What is the main source for BC at that site?
- 3) Page 12034 line 20-24: One should keep in mind the diameter measured by SP2 and DMA are different.

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4) Page 12035 line 11: D_p/D_c was used in this manuscript as aging indicator. More discussion should be given to support this assumption.

5) Page 12037 line 9: Long range transport? I would like suggest to replace “long range transport” with “aging process”.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 12025, 2015.

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