**Atmospheric
Chemistry
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Discussions**

Interactive
Comment

Interactive comment on "Size-resolved measurement of the mixing state of soot in the megacity Beijing, China: diurnal cycle, aging and parameterization" *by* Y. F. Cheng et al.

Anonymous Referee #1

Received and published: 26 January 2012

The paper uses measurements taken during the CAREBeijing experiment to develop an empirically-based model of the conversion of externally mixed soot particles to internally mixed particles. In addition, parameterizations of the fraction of internal mixed particles based on air mass aging indicators are proposed. The results presented in the paper should add to the basic understanding of the processes and time scales involved in the conversion of externally to internally mixed soot particles. The paper should be published in ACP after the following issues are adequately addressed.

The analysis presented relies heavily on VTDMA measurements of particle volatility as a function of particle size. Section 2.2. provides a good description of how the VTDMA

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measurements are made and used in the analysis. In contrast, Section 2.4 describing the treatment of the CCN counter data and how they were adapted to this analysis is lacking detail.

Abstract, line 1: omit "regarded"

Abstract, line 28: Need to describe the "size shift". Does it refer to the growth of smaller Aitken mode sized-particles to larger sizes?

p. 32164, lines 7 – 8: Yields a more realistic description of F_in relative to what?

p. 32164, line 21: Change to "Soot particles, after emission, undergo aging processes..."

p. 32164, lines 25 – 26: Why does internally mixed necessarily mean coated and externally mixed means uncoated? Other mixing configurations are possible and have been observed.

p. 32164, line 27: change to "related to its direct radiative...."

p. 32165, line 6: change to "and hence influence cloud formation processes..."

p. 32165, lines 7 – 10: This sentence needs to be re-written for clarity.

p. 32165, line 11: Why is "turnover rate" being used to describe what is really a conversion rate? Even the text says that "the turnover rate is used to describe the conversion rate...."

p. 32165, line 13: use "assumed" instead of "taken"

p. 32165, line29: change "determine" to "detect"

p. 32166, line 6: change to "and OC to EC"

p. 32166, line 18: change to "and the influence of emissions on it"

p. 32168, lines 16 – 18: Sentence starting with "For large particles..." needs to be

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re-written for clarity.

Section 2.4.: More detail should be added to help the reader understand exactly how the cumulative distribution function of particle hygroscopicity was derived from size-resolved CCN efficiency. A first step in the description would be explaining how the CCN counter and the DMA were operated to produce size-resolved CCN activation curves. The sentence on lines 16 – 19 on p. 32170 needs to be re-written and elaborated on for clarity.

p. 32171, line12: perhaps you mean "…this does not mean that the age of an air mass can become infinitely large as injection of fresh emission…"

p. 32171, lines13 – 15: Fix sentence for clarity.

p. 32172, line 6: change to "which reduces"

p. 32173, lines 21 – 22: Are there single scattering albedo data that can be reported from this campaign? SSA needs to be defined the first time it is discussed and any relevance to the aging process should be described.

Figure 5. The caption needs to clearly state what each parameter shown is normalized by.

p. 32174, last paragraph: Clarify what the starred parameters represent.

p. 32176, line 19: change to "..and low $Kex \rightarrow$in resulting from both slower…"

p. 32176, lines 20 - 24: These sentences are confusing. Attention should be paid to what values? Daytime? Night-time? And why? The last sentence of this paragraph needs to be edited for clarity.

p. 32182, line 16: change to "..by the time they leave…"

Finally, the paper needs to be edited for grammar.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 32161, 2011.