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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Optical-chemical relationships for carbonaceous aerosols observed at Jeju Island, Korea with a 3-laser photoacoustic spectrometer" *by* B. A. Flowers et al.

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Major comments from Anonymous Referee #1

âĂŤ The possibility of secondary acid-catalyzed reactions producing light absorbing material is an important consideration we did not acknowledge in the submitted version of the manuscript. It is possible to estimate the acidity of the particles arriving at Jeju during CAPMEX by comparing the measured molar concentration of cationic species (NH4+ and Na+) with the amount predicted to neutralize the molar concentration of anionic species present in the aerosol. We have performed this analysis and find the particles neutralized in the bulk. We have added a paragraph to the manuscript

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Interactive Discussion

Discussion Paper

describing the particle acidity analysis.

âĂŤ We have attained the size distribution measurements from our co-authors and have repeated the size dependent analysis of enhanced absorption at 405 nm. This has added significantly to the depth of the analysis and we are grateful to the reviewer for bringing this to our attention. By obtaining the particle size distributions throughout the campaign, we derived wavelength-dependent complex refractive indices that we use in addition with the chemical composition and optical property measurements to perform an optical closure study on the aerosol observed at Jeju during CAPMEX. The details of this analysis are the basis of the considerably re-written manuscript.

âĂŤ In re-writing the manuscript, we have addressed the place of brown carbon in aerosol light absorption by improving our description of the definition of mass absorption cross sections and delineating the contributions of black and brown carbon to MACs for carbonaceous aerosol. Studies such as those reported by Hecobian et al. (2010) are based on extracting water-soluble organics from sampled aerosol. Our instrumentation measures BC and BrC directly, without using filter-based techniques and off-line analysis. We do note in the manuscript that the particles in CAPMEX are not acidic and have likely not undergone secondary chemical reactions to produce significant amounts of light absorbing material. Instead we suggest particle nitration as one means of increasing light absorbing material in the aerosol as an effect of long-range transport.

âĂŤ The 3-laser photoacoustic absorption measurement provides for a measurement of soot (at 781 nm) and organic carbon (at 405 and 532 nm) within the aerosol. Because we observe absorption of light at 781 throughout the campaign as well as report measured masses for elemental carbon, we did not consider the absence of soot in our analysis.

Detailed comments from Anonymous Referee #1 âĂŤ We deleted " (an optical model of soot)" from the text âĂŤ We made the recommended change to the text after agreeing

ACPD

10, C8047–C8049, 2010

with the reviewer's perspective on the sentence. âĂŤ We corrected the spelling of CAPMEX. âĂŤ We accepted the reviewer's suggestion and changed the sentence accordingly. âĂŤ As part of the re-writing of the manuscript, this section has been changed significantly and re-written. Hopefully the confusion has been alleviated. âĂŤ We accepted the reviewer's suggestion and changed the sentence accordingly. âĂŤ We removed "organic nitrates" from the list. âĂŤ We modified the sentence to remove "with idealized assumptions". âĂŤ This was an error of the typesetting program. We will check more thoroughly for these issues in the future. âĂŤ This was an error of the typesetting program. We will check more thoroughly for these issues in the future. âĂŤ See previous two comments. âĂŤ Our new version of the manuscript has explicitly described how the uncertainty estimates are established. âĂŤ We corrected the spelling of "should". âĂŤ The conclusion section has been re-written considerably. The results and their significance have been written and delineated much more clearly after revision. âĂŤ We deleted the suggested text.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/10/C8047/2010/acpd-10-C8047-2010-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 9369, 2010.