Atmospheric Chemistry and Physics Discussions

Interactive Comment

Interactive comment on "The role of iron and black carbon in aerosol light absorption" *by* Y. Derimian et al.

Y. Derimian et al.

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We are very thankful for this constructive comment. Indeed the modified equation as suggested in the comment has several advantages. The third element of the initial equation can be removed under the reasonable assumption that only Fe and BC are responsible for variability in spectral SSA. Additionally, the sign of the BC parameter (a2) is consistent with the observations and the parameter itself became significant. These advantages are convincing despite the fact that fitted correlation coefficient became lower (decreased from 0.85 to 0.78) and the standard error of the Fe estimate became higher than in the initially suggested model. Following this and the other referee's (G. Schuster) comments we decided to go further and tried to develop and justify the proposed equation that connects spectral SSA, Fe, and BC. The initial form of the equation was based on logic which came out of an observational experience. How-

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ever, we tried to develop this relationship algebraically. We adopted the following logic: SSA can be presented in terms of absorption and extinction optical thickness, which in turn can be presented as specific values per unit concentration, multiplied by concentrations of the elements responsible for absorption and extinction. We assumed that the measured Fe and BC concentrations are the major elements that are responsible for absorption. After some algebraic development we defined coefficients of the multivariate regression. As a result we obtained a new equation, which in addition to the concentrations of the chemical elements also accounts for aerosol size in terms of Angstrom parameter. The derived parameters of the new equation are significant, and the signs of the Fe and BC parameters are consistent with observed negative and positive correlations versus SSA difference. Although the modified equation gives slightly different results for derived Fe, they are still comparable with the literature. In addition, the parameters of the new equation have specified physical meaning. The standard error of Fe estimate is between +- 1.6 to 1.9% for the worst scenario. The detailed description of the new equation and discussion of the results are presented in the modified version of the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 8159, 2007.

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