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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Black carbon over Mexico: the effect of atmospheric transport on mixing state, mass absorption cross-section, and BC/CO ratios" *by* R. Subramanian et al.

Anonymous Referee #2

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Review of the manuscript titled:

Black carbon over Mexico: the effect of atmospheric transport on mixing state, mass absorption cross-section, and BC/CO ratios By R. Subramanian1, G. L. Kok, D. Baumgardner, A. Clarke, Y. Shinozuka, T. L. Campos4, C. G. Heizer4, and B. B. Stephens

General comments,

The authors have presented BC data measured by aircraft observations using SP2 technique and discussed the roles of transport and transformation over the urban Mexico. The data set is basically of interest. The paper attempts to discuss the mixing state, mass absorption cross-section, and BC/CO ratios observed. However, the three

topics are presented without close relations among them. The analysis of the data on each topic is incomplete and not systematic. No solid results are draw here. In many parts of the paper, technical issues specific to their SP2 are discussed. This is not new, however. In addition, the discussion of MAC has little relevance to the other two issues. More concrete comments are given below. Probably, the authors should focus on the mixing state of BC. However, this requires a thorough revision of the present manuscript. It will be difficult to draw meaningful conclusion using only the materials given in this manuscript. Therefore I do not recommend the publication in the present form.

Major comments:

1. The authors conclude that no significant change of BC coating proceeded by aging. There are no descriptions on how they estimate ages of air masses. This must be explained clearly. If chemical processing occurs, secondary aerosol is formed. This should be shown. The coating of anthropogenic BC proceeds only if secondary aerosol is formed. The relationship between secondary aerosol and BC coating is the first step that should be investigated. This point is completely lacking. All the discussion and analysis of BC coating in this paper are not made from the viewpoints of physical and chemical processes causing the BC coating. Specific point: It is hard to understand the important points extracted from Figures 8 and 9. This should be clearly explained.

2. The discussion of MAC is not supported in many ways. Recent studies [e.g., Kondo et al., Aerol. Sci. Tech., 43, 741-756, 2009] indicate difficulty in detecting the increase in the photo-absorption of air-borne BC by internal mixing using filter based instruments. They also show that the previous corrections for multiple scattering applied in deriving the absorption coefficient are largely in error because of size dependence of the penetration of BC into filter fibers. The corrections by the previous studies have to be re-evaluated, although this is the beyond the scope of the present study. Even if more reliable corrections are made, it is very difficult to derive the absorption coefficient of air-borne BC particles. Interpretation of the absorption coefficient in terms of

air-borne BC by filter based instruments is now outdated unless new ideas overcome this difficulty, although they can be used to estimate BC mass concentrations.

3. The points of the discussion on BC/CO ratios are very unclear. The authors fail to discuss the ratios in relevance to the emission ratio of these species in the source region in a quantitative way. The ratios obtained in very different environment (source region versus outflow or remote areas) are compared, without clarifying the differences and similarities of the conditions in different regions. We can extract little useful information from this comparison.

There are many minor comments. However, the major comments stated above already exclude the publication of this paper in the present structure.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 9081, 2009.