Atmos. Chem. Phys. Discuss., 7, S6325–S6327, 2007
www.atmos-chem-phys-discuss.net/7/S6325/2007/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Applications of Lagrangian dispersion modeling to the analysis of changes in the specific absorption of elemental carbon" *by* J. C. Doran et al.

**Anonymous Referee #3**

Received and published: 24 October 2007

The manuscript; “Applications of Lagrangian dispersion modeling to the analysis of changes in the specific absorption of elemental carbon” by J.C. Doran et al. is a follow up of a previous paper “The T1-T2 study: evolution of aerosol properties downwind of Mexico City”. In the previous work, wind profiler data was used to compute trajectories of air parcels out of the MCMA in order to identify likely transport periods from the city over site T1 and T2. It was concluded that the earlier treatment that included only sources from the MCMA alone was an oversimplification and a more detailed treatment of the EC dispersion in the region was necessary. In this work, a Lagrangian dispersion model driven by a mesoscale model with four dimensional data assimilation is used to simulate the dispersion of EC over the Mexico

City regional area during the MILAGRO campaign. This new treatment includes MCMA and non-MCMA sources as well as biomass burning sources in the region.

The manuscript is well written and well organized and represents an improvement over the previous work published in ACP.

Some questions remain as to how good the emissions inventories for the Mexico City region are, and how much are these estimates expected to affect the modeling results. The comparisons shown in Figure 6 for T2 are of special concern and perhaps more effort should be made to better explain the discrepancies.

Page 15001: It is reported that the average specific absorption in mid morning hours is 9 m2/g. Is this T1 only? This value is difficult to reconcile with the results reported in Figure 8 and Table 2 that report maxima around 7m2/g. It would be easier to visualize if a Figure could be added showing the day-to-day variation in specific absorption at T1 and T2. This would be especially helpful since the original Figure 7 of the previous work was later reported to be in error (Corrigendum).

Page 15001: A comparison is given of specific absorption determined in Mexico City ranging from 9 m2/g (this study) to 4.5 m2/g. The difference is attributed to the differences in techniques used to measure the absorption and a future side-by-side comparison of techniques was suggested. Other side-by-side comparisons have been attempted in the past (eg Reno Aerosol Optics Study). Do the results from these past studies substantiate this conclusion? Explain the biases in the methods used and how much they are expected to affect the results reported.

Table 2: Is this for T1 data only?

Figure 8: The minimum values in the Figure are about 4.6 m2/g and the maxima are about 7.3 m2/g. It is reported in the Introduction section that freshly emitted soot should have a value of 7.5m2/g and aged soot should increase from that value. Why are the values in Figure 8 so much lower than expected?



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Include error bars in Figures 8 and 10 to indicate the magnitude of the range of values used to obtain the medians shown.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 14989, 2007.



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