

Interactive comment on “Characterization of ambient aerosols in Mexico City during the MCMA-2003 campaign with Aerosol Mass Spectrometry – Part I: quantification, shape-related collection efficiency, and comparison with collocated instruments” by D. Salcedo et al.

Anonymous Referee #2

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General comments

This paper describes the characterization of ambient aerosols measured by an Aerodyne AMS during the MCMA-2003 campaign. This paper presents some interesting

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results (e.g. BWP experiments) that have not been previously published. However, the authors discuss too many issues in this paper. I would strongly recommend that the scope of this paper (Part I) should be limited to characterize the CENICA AMS, mainly focusing on the BWP experiments and the comparison with DustTrak Monitor (the comparison with AML AMS, TEOM, and LASAIR should be removed). In my opinion, the paper is valuable and should be publishable in ACP after the authors make necessary corrections. However, I am not very sure whether such technical issue is acceptable as a standalone ACP paper. Detailed comments are given below.

Specific comments

(1) Calibration

p. 4151, line 23: The decrease in the AML AMS IE is most likely due to an inlet alignment change caused by abrupt motions during on-road operations. Does the AML AMS have a BWP? If not, how do the authors justify that the particle beam was properly aligned during on-road operations?

p.4152, line 7: During the final few days (presumably 01/05/2003-04/05/2003), the IE/AB value for the CENICA AMS was chosen by comparison with co-located AML AMS data. On the other hand, these data are used for the comparison between two AMSs (section 3.2). In Figure 6, the data points for the final few days correspond to the blue and purple symbols, which (obviously) lie on the 1:1 line. If we remove these data points, the CENICA AMS mass is systematically higher than the AML AMS mass.

The comparison with AML AMS is not very informative considering the differences in the instrument configuration (orifice) and sampling location (parking lot versus top of building). Therefore I recommend that the Figure 6 should be removed from the paper.

(2) BWP experiments

The BWP experiments are interesting, as it can provide not only the shape-related collection efficiency but also the mixing state of ambient aerosols.

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p.4160, line 27: The authors say that the similar attenuation for all species for the accumulation mode is suggestive of internal mixing most of the time for this mode. While this may be true, it is important to mention that there is a clear difference between sulfate and organics in the smaller size range (< 300 nm). This suggests that sulfate and organics are externally mixed in the smaller size range. The ammonium size distribution is not very informative because of its large uncertainty.

Figure 5b: The m/z 44 signal is compared to the signal attenuation. I think the ratio of m/z 44 to total mass (or total organic mass) would be a better indication of particle aging.

(3) Comparison with collocated instruments

p.4158, line 23: The DustTrak measurement was calibrated with gravimetric filter measurements taken by CENICA during the MCMA-2003 campaign. Regarding the conversion of light scattering signals to particle mass, the authors need to assume some parameters (refractive index, density, and shape), which depend on ambient conditions. What is the uncertainty in the DustTrak measurements due to the assumption of these parameters (based on the comparison with gravimetric filter measurements)?

p. 4165, line 5: The authors say that the LASAIR undercounts the particles when ambient aerosol loadings are very high. However, the discrepancy between the AMS + BC + soil and LASAIR mass is also found at lower aerosol loadings in Figure 9.

It looks to me that the TEOM and LASAIR data were not very reliable during this campaign. The only useful information derived from the LASAIR measurement is aerosol mass between 1 and 2.5 μm . I recommend that the authors should focus on the comparison with DustTrak Monitor and remove the comparison with TEOM and LASAIR.

One of the major conclusions of this paper is that the AMS + BC + soil mass concentration during MCMA-2003 is a good approximation to the total PM_{2.5} mass concentration. If this paper really focuses on the characterization of the CENICA AMS,

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the way the result is presented should be slightly modified. The NR-PM_{2.5} mass can be estimated by calculating DustTrak minus BC minus soil. The plot of CENICA AMS versus NR-PM_{2.5} mass will provide a direct evaluation of the AMS measurement. It would be interesting to look at the temporal variation of the residual (= NR-PM_{2.5} minus CENICA AMS) and the correlation of the residual with any other signals: m/z 44 (aging), supermicron mass fraction (PM_{2.5} minus PM₁ derived from LASAIR), etc.

(4) Other comments

p.4151, line 17: reasonably constant. Please quantify the variability. Same comment for p.4151, line 29: nearly constant

p.4152, line 2: During the final few days. Please specify the actual period of time.

p.4154, line 8: CE = 0.43 would not be a realistic number, considering that Eb for ambient aerosols is difficult to determine (p.4154, line 26). “CE ranging from 0.4 to 1” would be better.

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