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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurement of ambient aerosols in northern Mexico City by single particle mass spectrometry" *by* R. C. Moffet et al.

R. C. Moffet et al.

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Reply to Reviewer 1

We thank the reviewers for their careful review of our manuscript. We have addressed each comment below in italics.

1) Experimental: The presented results rely on complex measurement and analysis techniques. The authors should provide a short description of the uncertainties involved with these measurements and quantify the associated errors.

It is also unclear how the particulate water is treated in the measurements.

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Discussion Paper

Are the particles dried prior to their chemical analysis or is the water included?

Particles were not dried prior to analysis. Measurements indicate that the nozzle does not evaporate aqueous particles. However, the RH in MC was very low and the particles were expected to contain small amounts of water. This was indeed the case based on optical measurements that are described in another paper comparing the microphysical properties of the Mexico City aerosols to Riverside aerosols that was submitted to JGR. One of the conclusions in that paper is that the Mexico City particles contained relatively little water.

We added a discussion on the counting statistics for the single particle mass spectrometer to the discussion to address the uncertainties.

2) Chemically resolved particle size distribution: Biomass particle seems to be one of the major aerosol components in Mexico City. According to the results displayed in Fig.3, the mean diameter of the mass distribution ranges from 0.6-0.8 μm, which is rather characteristic of aged smoke particles (several days). Please comment on how the obtained results compare with the values commonly reported in the literature (Fiebig et al., 2003 and references therein). This larger diameter can also be an indication that Biomass class may be dominated by the secondary organic aerosols. At this point, it will be interesting to discuss on how the size distribution of various species vary during the day. The comparison of the size distribution obtained in the morning and afternoon hours should provide a good indication of the production of SOA species.

In the initial version of the paper, we used an APS to scale the ATOFMS data as described in a previous publication by our group. We later determined that the APS

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was not detecting small particles effectively, leading to a large (incorrect) shift to larger sizes in the scaled size data plotted in Figure 3. As a result, in the revised manuscript we now use unscaled ATOFMS data. The peak of the size distribution of the biomass particles is now closer to 300 nm which is consistent with previous reports (i.e. Reid et al.). As we note in the revised manuscript, the unscaled ATOFMS size distribution most closely estimates the volume distribution due to the inherent transmission efficiency dependence of the inlet which goes as D-3 (Allen et al. 2000). Notably, we examined how much the size of the aged biomass particles shifted (over the fresh biomass particles) and measured a shift of 50 nm which is consistent with previous reports for biomass aerosols that have been aged for 1-3 days.

3) Authors have shown that inorganic nitrogen species are mostly found associated with mineral dust particles. This heterogeneous formation of coarse-mode nitrate on dust particles has been observed in several field campaigns and modeling studies (e.g. Hodzic et al., 2006; Putaud et al., 2004). Can the contribution of this heterogeneous formation to total nitrate concentrations be quantified from the present dataset?

In this paper, we quantified the amount of nitrate on dust in terms of the fraction of particles containing nitrate. In current lab studies, we are using ion chromatography (PILS-IC) to quantify the ATOFMS nitrate ion signals on dust ensembles. We plan to provide quantitative mass data on the amount of nitrate and sulfate on dust once these calibration studies are complete.

4) Average diurnal trends: Fig. 7: What is the diurnal trend of the HMOC component?

HMOC peaks at night as shown in the trace added to Fig 7.

Fiebig M, Stohl A, Wendisch M, Eckhardt S., Petzold A., Dependence of solar radiative

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forcing of forest fire aerosol on ageing and state of mixture, Atmos. Chem. Phys. 3:S2692 881-891, 2003.

Hodzic, A., Bessagnet, B., Vautard, R.., A model evaluation of coarse-mode nitrate heterogeneous formation on dust particles, Atmos. Environ, 40 (22), 4158-4171, 2006.

Putaud, J-P., Van Dingenen, R., Dell8217;Acqua, A., Raes, F., Matta, E., Decesari, S., Facchini, M.C., Fuzzi S., 2004, Size-segregated aerosol mass closure and chemical composition in Monte Cimone (I) during MINATROC, Atmospheric Chemistry and Physics, Vol. 4, 889-902.

Technical corrections:

The outline of the manuscript should be included at the end of the 8216;Introduction8217; section.

OK

Fig. 7: BAM data are difficult to distinguish on this figure. Add in the caption the type of line used for BAM data: (BAM, dashed red line).

OK

Section 3.3, line 11: Figures 3 and 4 should be changed to Figures 4 and 5.

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OK

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Interactive Comment