Atmos. Chem. Phys. Discuss., 9, S235–S238, 2009
www.atmos-chem-phys-discuss.net/9/S235/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The time evolution of aerosol size distribution over the Mexico City plateau" *by* L. I. Kleinman et al.

Anonymous Referee #1

Received and published: 15 February 2009

This paper presents results from airborne measurements on PM size distributions and time evolutions over the Mexico City plateau. The size spectra of aerosol number and volume were analyzed as a function of photochemical age estimated by NOx/NOy. CO was used as a conservative trace to account for the dilution of urban plume. The age-dependent changes in the number and volume distributions of accumulation mode particles were examined. The observed aerosol size evolution is in better agreement with condensation growth mechanism. This work represents a further analysis of the aerosol data from the MILAGRO Campaign, for which a high quality article was published by the same authors last year on the evolution of aerosol composition over the Mexico City plateau. This work is of good quality too. The analysis was clearly well performed and the paper was well written. This topic clearly suits the scope of ACP. I

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highly recommend its publication after the following comments have been addressed.

I find the meaning of this sentence in the Abstract - "There is growth in aerosol volume because there are more accumulation mode particles, not because particles are larger "- is somewhat vague. The additional accumulation mode particles seem to have grown from the Aitken mode. So, even though the mode size did not seem to increase, "particles are larger "was indeed the reason for the observed growth in aerosol volume.

For the differences in the morning and afternoon size distributions observed in this study it will be interesting to hear the authors elaborate a bit more on the causes.

P 1624, line 2, please cite the values for the "typical densities"used in the calculations.

P 1626, 2nd paragraph, will be useful to discuss how good the homogenous assumption is. What's the typical spatial coverage of a flight during a min?

P 1627, line 6-8, please clarify the meaning of "It is required that the CO/NOy ratio be near that observed in plumes which unmistakingly have an urban origin. "It will be useful to give the range of ratios used as criterion. Same for the CH3CN/CO ratio used for eliminating biomass burning influences.

P 1627, line 7, replace -unmistakingly- with -unmistakably-?

P 1630, line 23, it seems that a ". "is missing after "AM ".

P 1633, line 20, "organic spectra "is often used to refer "organic mass spectra ". Although it is quite clear from the context what it is referring to at here, I would like to suggest using "organic size spectra "to avoid confusion.

Regarding the discussions on the observed rapid "growth "of AM1 to AM5 (p 1635), it was suggested that the precursor to AM5 being particles emitted the previous day or overnight. It could be useful to mention the possible sources of these "older "particles. Is the morning boundary layer development mainly responsible for it?

Table 1, it could help the readers if the "definition "of aging is repeated in the table

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caption.

Fig. 1, in the figure caption, please spell out the particle size range selected for integration for each method. The figure will also be easier to see if different colors, in addition to different symbols, are used for the AM and PM data points. The linear regression coefficients and Pearson R for the two sets of correlations could be useful to see.

For the discussions on p1630, 2nd last paragraph, a question I have is how variable the AM and PM ratios are within each photochemical age bin? How about adding error bars to the AM and PM data points in Fig. 3?

Fig. 4, missing x-axis label for the bottom plot

Regarding the analysis on dependence of aerosol number and mass on photochemical age (4.2), it could be interesting (and useful) to summarize either in a table or a figure the linear regression statistics (slope and intercept and the corresponding uncertainties) and the correlation coefficients for the 10 plots show in Fig. 5.

It could be interesting to see the size spectra of the background aerosol (number and volume) in AM and PM separately, assuming there is enough signal to noise in such data. They may be presented in Fig. 6.

I believe the absolute values of the size spectra are informative. I therefore suggest Fig. 6 to be modified. Instead of showing normalized spectra, it is better to plot the spectra on separate y axes and scale the y axes to the corresponding maxima. In this way, one can see clearly the differences in shapes of the size spectra. One can also see well the absolute differences between spectra. A same comment applies to Fig. 7.

Fig. 8, how do the nitrate and sulfate size distributions from AMS vary as a function of photochemical age? Also, I am curious, why is only the organic mass, not the total (= organics + inorganics) from the AMS shown? Fig. 10, please add the letters on the corresponding plots.

In my opinion, a more straightforward display of the Fig. 11 data is to show the same

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set of plots as those in Fig. 10. Better, to merge these two sets of plots and place the volume growth plots next to the condensational growth plots.

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