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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Relationships between submicrometer particulate air pollution and air mass history in Beijing, China, 2004–2006" *by* B. Wehner et al.

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The authors present a wealth of aerosol physics data from a geographical location and anthropogenic source area, Beijing and northwestern China that is of importance regionally and globally and that historically has not had such an intense measurement series as this. The submicrometric aerosol measurements were coordinated with meteorological measurements at the surface and aloft and with air mass trajectory analysis. Two previous papers have presented results and analysis of subsets of this data in a more focused context. This manuscript presents a general summary of the entire data set in the context of diurnal and source region averages and their relationships to

local meteorological parameters and trajectories. The data set is extensive and could support further analyses and discussions.

Coagulation is referred to frequently as the process that explains the shift in size distribution modes to larger sizes under higher ?pollution? levels. Of course there are other processes, condensation and aqueous phase gas-to-particulate mass conversion that should be mentioned and dismissed or discussed as appropriate.

Figure 2 is not particularly informative. It demonstrates the progression of positive and negative correlation with size increment. This information could be expressed in a few sentences of text along with regression statistics.

Page 1335 Line 25 "The mean evolution of the total number and volume concentration is shown in Fig. 13. ..." I disagree with this analysis. First what is shown in figure 13 is the 24 hour, diurnally averaged time series. To say that this is represents aerosol number or volume evolution requires that it be, strictly speaking, a Lagrangian time series or at least a single, relatively homogeneous air mass. I propose that the mid-day increase in [N] for trajectory clusters 1 and 2 and to a lesser extent clusters 3 and 4 are due to mixing of two or more air masses, the residual night-time surface based air mass, a residual boundary layer and a free tropospheric air mass that are mixed by instability developing during the late morning and early afternoon. Figure 14 and discussion associated with it support this on average. Otherwise you have to propose a sink or removal mechanism for the particulate volume in that time period.

It seems like the trajectory analysis by cluster is more useful and well defined that the analysis by sector. What additional information or insight does the sector analysis provide?

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