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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurements of aerosol absorption and scattering in the Mexico City Metropolitan Area during the MILAGRO field campaign: a comparison of results from the T0 and T1 sites" *by* N. A. Marley et al.

Anonymous Referee #1

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Review of Measurements of aerosol absorption and scattering in the Mexico City Metropolitan Area during the MILAGRO field campaign: a comparison of results from the T0 and T1 sites; by Marley et al.

General comments:

At the title implies, this paper discusses absorption and scattering at the T0 and T1 sites during the MILAGRO campaign. Many instruments were employed to measure these properties, including a PSAP, MAAP, nephelometer, and a photoacoustic spec-

trometer. Additionally, other measurements are used to find other quantities of interest, such as the specific absorption of black carbon. The paper is essentially a summary and cataloging of the measurements. Although the paper is a little weak in providing an interpretation of the measurements, I still find it a valuable contribution to MILAGRO campaign, because it provides a convenient reference for the absorption and scattering properties at the T0 and T1 sites. Therefore I am recommending publication, subject to the points raised below.

Specific comments (some trivial, some not so trivial [NST]):

(1) Trivial: When referring to the absorption and scattering measurements, the authors sometimes omit the wavelengths of the measurements. This deficiency is acutely apparent in the abstract, where the wavelengths are not mentioned at all. A casual reader of the abstract could not interpret the results presented therein without the wavelength information.

(2) Trivial: The particle sizes in the paper are stated as being in the 0.1 to 2 mircon ranges. I assume these are diameters?? Please state whether these are diameters or radii.

(3) Trivial: Page 12642, third paragraph. The MFRSR SSA is 0.89 for day 86. This could be a day of significant rain, and if so, the explanation for the relatively large SSA, provided at the end of the paragraph, would be less valid because many of the coarse mode dust particles are rain-scavenged from the atmosphere. Maybe we don't know why the SSA is large on this day? Maybe some absorption species are also scavenged?

(4) NST: Many absorption measurements described in this paper are filter-based measurements. Recent evidence suggests that filter-based measurements can be problematic in presence of large amounts of organic carbon – an aerosol constituent with a large abundance in the Mexico City Metropolitan Area (Salcedo et al., 2006). Under these conditions, the problems of filter-based measurements have been discussed

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in Lack et al. (2008) and Subramanian et al. (2007). While I have no evidence to suspect that the filter-based absorption measurements are invalid, I suggest that the authors at least mention that they are aware of the possible problems with the these measurements.

(5) NST: The measurements are confined to fine mode particles, with radii less than 1 micron. One could then question how relevant the single scattering albedo (SSA) is to radiative transfer calculations because the coarse mode is omitted. I know that in some isolated circumstances in the MCMA, omitting the coarse mode can cause a significant error in SSA inferences. I am suggesting that the authors try to estimate the effect of omitting the coarse mode. Here's a possible plan of action, which could be completed in a day or two:

a) Take as the size distribution, two superimposed log-normal distributions; one for the fine mode and the other for the coarse mode – as described in Dubovik et al. (2002), or even better, use surface-based measurements to infer the size distribution. (Alas, I don't think the coarse mode measurements are easy to find, if they were indeed made).

b) Assume a constant index of refraction for the aerosol, say 1.50-i*0.03.

c) Using Mie theory, find the scattering and extinction efficiencies over a radius range of, say, 0.01 to 20 microns.

d) Using (a) and (c) above find the extinction, scattering, and SSA over the entire radius range that includes the fine and coarse modes. This provides the "fine and coarse" mode SSAs.

e) Repeat the above except limit the size range to particle radii less than 1 micron. This provides the fine mode SSA.

f) Compare (d) and (e) to see if there's a big difference. My guess is that the difference will be less than 0.01.

g) I note in passing that when there's a lot of dust around, which sometimes occurred

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during the MILAGRO campaign, the difference could be much larger than 0.01.

Technical comments:

(1) page 12634, first full sentence. Should 'low particle loading' be changed to 'high particle loading'?

(2) Page 12635, line 25. 'Mckinlay' should be 'McKinlay'?

(3) Page 12644, line 18. Should the (45*) be (0*)? Conventional scattering theory assigns a scattering angle of 0 to the forward direction.

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