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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Primary and secondary contributions to aerosol light scattering and absorption in Mexico City during the MILAGRO 2006 campaign" *by* G. Paredes-Miranda et al.

Anonymous Referee #3

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General comments:

This paper summarizes the behavior of aerosol optical properties (absorption and scattering, from which single-scattering albedo [SSA] is derived) at the T0 site of the MILAGRO campaign. The paper shows these quantities averaged (apparently) at half-hour intervals over the entire day. After the presentation of the optical properties, the diurnal variation of the optical properties are explained as stemming from the processes of boundary layer (BL) dilution and the production of secondary aerosol species, including secondary organic aerosol (SOA).

I like this paper and recommend its publication, for two reasons. First, the paper is short

and to the point, and is easy to read and understand. In this regard, the paper serves as a model for other papers. Second, the science, and in particular the correlation between increased values of SSA and the production of secondary aerosol species, seems strong. Although the usual caveat holds "correlation does not prove causation", the evidence presented and the explanations given are fairly convincing that, yes, the production of secondary species has a big effect on the aerosol optical properties.

Specific comments:

I am a little concerned about the issues listed below. However, I think these issues can be cleared up easily, maybe with a change in wording or the addition of more explanation.

(1) The role of BL dilution. It's easy to understand how BL dilution – the entrainment of clean air into the polluted BL – will change Babs and Bscat. However, it's hard for me to understand (from this paper) how BL dilution will change the SSA, which is an intrinsic property of individual aerosol particles, as it does not depend on aerosol concentration. BL dilution is mentioned several times in the paper; for example, BL dilution is implied in altering the SSA on page 16959, line 13. Maybe I am reading too much into this section, but if I am not, then more clarification on the role of BL dilution is necessary. Also, see page 16958, line 24. I do not understand the statement that "the BL rise in the morning does not perturb the observations"; surely it must perturb Babs and Bscat.

(2) The paper only considers the fine mode aerosol. AERONET observations (e.g., Dubovik et al., 2002, Journal of the Atmospheric Sciences, 59, 590-608) taken at a site in Mexico City indicate a significant amount of the aerosol volume (mass) in the coarse mode (diameter $>$ 2.5 um). My guess is that there will be too few particles in the coarse mode at the T0 site to influence the conclusions expressed in the paper. Is there anything the authors might do the reassure the reader that the coarse mode can be neglected? Maybe all that is possible is a flat statement that there's too little information about the coarse mode to consider it in this paper (and in any event, the

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effect of the coarse mode is probably small).

(3) Eqn. (1). It seems to me that the numerator of Eqn. (3) is expressed exactly as Bscat - (Bscat,p/Babs)*Babs, where Bscat,p is the scattering of the primary aerosol. I am concerned how well the expression SSAp/(1 - SSAp) approximates the Bscat,p/Babs (where SSAp is the SSA attributed to primary sources). In other words, to what extent is Eqn. (1) an approximation? I don't think this is a major issue but a little clarification would be useful.

Technical comments:

(1) Almost all papers dealing with the aethelometer seem to promote different spellings for this instrument. This paper is no exception, and in the paper "aethelometer" is spelled in three different ways. I think the correct spelling is "aethelometer", or so I hope....

(2) page 16953, line 5: I assume the emission values are daily values? Or monthly?

(3) The paper should spell out the time averaging interval for the optical properties. Maybe it's mentioned in the paper and I didn't see it.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 16951, 2008.