Atmos. Chem. Phys. Discuss., 8, S6227–S6230, 2008
www.atmos-chem-phys-discuss.net/8/S6227/2008/

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 #2

Received and published: 21 August 2008

Review of "Measurements of aerosol absorption and scattering in the Mexico City Metropolitan area during MILAGRO field campaign: A comparison of results from the T0 and T1 sites" by Marley, Gaffney, Castro, Salcido, and Frederick.

This review follows publication of two other reviews, and will only cover topics not already discussed.

Overall, the paper is well written and clear, though needs major modification along the lines indicated before publication.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

1. This comment ties together line 15, pg 12628 (introduction, quoting 17.6% reduction of solar flux at the surface due to aerosols in MCMA), with line 8, pg 12645 (conclusion, suggesting that aerosol light absorption in the boundary layer promotes rapid development of the boundary layer expansion during daylight hours.). Expansion of the boundary layer during daylight hours is probably promoted most by absorption of solar radiation at the surface. Aerosol absorption aloft probably reduces atmospheric boundary layer expansion because it reduces the solar radiation at the surface, though the direct effect of absorption aloft would have some effect on boundary layer expansion. What is clear is that boundary layer dynamics will be affected by aerosol optics; the way this happens needs to be investigated.

2. pg 12626. Abstract. Here and in the rest of the paper, the authors often use average absorption and average single scattering albedo. First, there are many ways to perform averages. From an aerosol optics perspective where sunlight in the main radiation impacted by the aerosol it would be much more relevant to compute averages weighted by the solar irradiance, especially for the single scattering albedo. The average single scattering albedo should be computed from the average scattering and average absorption rather from averaging the time series for single scattering albedo.

3. Lines 6-7, pg 12632. Do the authors have a custom TSI MODEL 3563 nephelometer? The instrument as sold by the manufacturer operates with center wavelengths 450, 550, and 700 nm, though each also with an appreciable bandwidth as well.

4. Pg 12633. PSAP issues. The PSAP has a mass flow meter in it that results in aerosol light absorption measurements for an air parcel at standard conditions. Did the author's correct the PSAP data to the lower pressure of the MCMA? Roughly, PSAP(local MCMA) = PSAP(as measured) * AmbientPressure(MCMA) / 1013.25 mb. The ambient pressure at the MCMA is roughly 775 mb, so the local PSAP values would be about 77% of those read directly from the instrument. The Bond et al corrections for the PSAP ultimately result in the wavelength equivalent being 550 nm, even though a 567 nm LED is used on the PSAP. The PSAP data below a transmittance of 0.5 was

ACPD

8, S6227–S6230, 2008

Interactive Comment

thrown out... how much data was thrown out? With high concentrations, was the PSAP data set compromised?

5. Line 12 and eqs 2 and 3, pg 12634. The authors use both symbol "alpha", and the symbol "alpha sub A": Suggest sticking with the former notation, and the subscript doesn't help.

6. Line 4, pg 12634, 880 nm should be 870 nm.

7. Line 10, pg 12635. The use of an Angstrom coefficient for absorption of 2.1 for comparing PSAP and MAAP data is unwarranted and unwise, and needs strong justification. It is unlikely that biomass burning gives rise to use of such a large Angstrom coefficient. It is likely that a value of 1.0 should be used instead of 2.1.

8. Line 12, pg 12635. The Radiance Research neph is problematic because of its large truncation angle for forward scattering. It likely misses much of the scattering for larger particles, with errors approaching as large as a factor of 2. In addition, the optical filter on the Radiance Research neph is known to degrade badly with use, so that the optical bandwidth is much larger than when new, and the center wavelength is larger as well, as large as 565 nm. How was the Radiance Research neph calibrated? How was the TSI neph at T0 calibrated?

9. Pg 12635. Were the UV-B radiometers ever operated side by side at T0 or T1 for comparison?

10. Pg 12640. What is the purpose of showing absorption efficiencies in Fig 4 as calculated from total carbon? It seems fruitless. The organic fraction mass is not constrained by carbon measurements. The assumption of 30% black carbon of the total carbon is completely unjustifiable because this fraction is certainly durnally variant.

11. Pg 12643. The UV B measurements at T0 and T1 are very interesting. It is surprising that T0 has greater UV-B since aerosol concentrations are so much larger there. The TOMS satellite probably misses near surface ozone. What were the ozone

ACPD

8, S6227–S6230, 2008

concentrations at T0 and T1? Is it possible that ozone at T1 was larger than at T0, thereby explaining the UV B measurements? Was the diffuse radiation scattered into the UV B sensor at T0 impacted by the way the instrument was placed relative to items nearby that might strongly reflect radiation?

12. pg 12644. It is not necessary to repeat the equation for the Angstrom coeff in Eq. 5, as it was given earlier in the paper. You could simply just state that the Angstrom coefficient was calculated using scattering wavelengths 450 nm and 700 nm. However, the Angstrom coef for scattering is strongly impacted by the inlet system at T0 and the truncation error with larger particles for the TSI neph. It is likely that the Angstrom coefficient is larger than the true value for these reasons.

13. It is not justified to extrapolate aerosol optics inferences from the measured wavelengths to the UV-B wavelengths, especially with respect to aerosol composition and the wavelength dependence of aerosol optics.

14. What averaging times were used for the points in Figures 10 and 11?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 12625, 2008.