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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the diurnal variability of particle properties related to black carbon in Mexico City" *by* D. Baumgardner et al.

D. Baumgardner et al.

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We would like to thank the reviewer for the thoughtful review of our manuscript and the many helpful suggestions that were made. In particular, we have converted the parameter mass density to the more understandable and easier to interpret 'thickness of coating', as suggested by the reviewer. Secondly, additional information is provided concerning the importance of environmental BC (now renamed to 'light absorbing carbon-LAC') that is either smaller or larger than the size range of the SP2.

The paper has been modified somewhat after reanalyzing the measurements and correcting for a calibration error that was discovered. The new analysis establishes that the range of optical diameters that can be measured with the SP2 are from 100 to 400 nm and the LAC mass equivalent diameter range is from 120 nm to 650 nm.

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Response to specific comments (authors' response in italics)

1. (p. 1629, line11) It would be helpful if the authors explained the variables or parameters shown in their lognormal fit in Figure 3, C0 and Dg, either here or in the figure's caption.

The use of a lognormal fit has been removed as we have decided to present uncorrected masses except when estimating the yearly production of LAC. The corrected mass is estimated by comparing the absorption coefficients measured with the PSAP and derived from the SP2. Otherwise, presenting the LAC mass as measured does not change any of the relevant conclusion that are dependent on the properties of individual LAC particles and not on the bulk properties.

2. (p. 1629, line 21) The correct size cutoff should be 200 nm, not 200 micrometers. More importantly, it is not clear why in Figure 3, the left edge of the shaded area lies at a BCM equivalent diameter of 0.23 micrometers instead of 0.20 micrometers. Is this due to the use of the optical diameter versus the mass equivalent diameter? If so, please explain.

Figure 3 has been removed given that the lognormal correction is no longer being used in the analysis (see response to comment 2).

3. (p. 1631, line 20) Marr et al. (2006) did not claim that other organic compounds can also be ionized by the PAS. However, Matter et al. (Matter, U., Siegmann, H.C., Burtscher, H., Dynamic field measurements of submicron particles from diesel engines, Environmental Science and Technology, 33, 1946-1952, 1999) showed that the PAS response is correlated with BC.

Modified as recommended

4. (0. 1632, line 26) The researchers combine data from 2003 and 2005 in generating their figures. Were there no significant differences in ambient concentrations between these two periods, either due to differences in meteorology or in source strengths? In

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some cities, ambient concentrations of vehicle-related pollutants have been shown to change significantly over a two-year period due to turnover in the vehicle fleet to cleaner technologies. The authors should state whether there were differences between the two years.

An additional sentence has been added to explain that the standard deviations that are plotted as vertical bars in the time series represent not only day to day variations but year to year, demonstrating that even within relatively large variance, the daily cycles are still quite pronounced.

5. (p. 1636, line 8) The claim, "A shift from smaller, primary BCA to larger ones would suggest a shift from primarily auto traffic to a greater frequency of heavy vehicles like trucks and buses that use diesel," implicitly assumes that BC-containing particles emitted by diesel engines are larger. The authors should provide a reference for this assumption.

This section of the discussion has been revised.

6. (p. 1637, line 24) This section refers to the "thickness of the coating material," but it is never reported. Readers may be very curious about it, and the authors should present quantitative results on it.

The thickness of the coating, rather than the fraction, is now reported throughout the modified manuscript.

7. (p. 1638, line 18) According to the text, the particles shown in Figure 8d contribute 20

The text has been revised.

8. In Figure 4, it is not clear why the hourly error bars in b-e are so much larger than the 10-min error bars. The same comment also applies to Figure 5.

All of the diurnal time series are now presented with time intervals of 10 minutes, except

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for the CO values that are only available in one hour intervals.

9. In Figure 6, the position of a and b should be swapped with c and d.

Corrected as suggested

10. The period 1600-2000 (green line in the legend) does not actually appear in Figure 9. The figure caption claims that averages are shown for every six-hour period, but the legend shows four-hour periods.

Corrected

Technical corrections

11. (p. 1627, line 11) The size range is probably supposed to be 0.20 to 0.70 micrometers, or 200 to 700 nm, and not 0.20 to 0.70 nm.

Corrected to be 120 nm to 650 nm.

12. (p. 1630, line 28) Typo: “mreasured” in Equation 4 here and in the next line.

Corrected

13. (p. 1636, lines 23 and 28) Typo: “BMC.”

Corrected

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 1623, 2007.