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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonal trends in black carbon properties and co-pollutants in Mexico City" *by* A. Retama et al.

Anonymous Referee #1

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The paper discusses extended measurements of O3, CO, PM2.5 and PM10 and black carbon during 13 months in the Mexico City Metropolitan Area. The authors analyze the data for seasonal as well as daily and work- vs. weekend-day trends. They suggest that their findings show that the mitigation strategies for PM and BC have been less effective than those for O3 and CO. The paper is mostly well written and the analysis is sound, the conclusions are very interesting and deserve publication with only some minor changes.

General comments: Explicitly state the wavelength of the PAX used here (870 nm?). As mentioned later on, the discussion on the wavelength is a bit confusing. The potential effect of wet scavenging is mostly ignored. Only on line 26 of page 12557 there is a brief mention of precipitation. Using the data available (I would guess that rain

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gauges data are also available for the area for example), it should be possible to see if wet scavenging (either nucleation or collision and coalescence) might be an important factor influencing seasonal variability of some of the pollutants, especially with regard to particulate. It would be interesting to see at least some mention of this possible source of variability. The authors conclude that the emission reduction strategies did not bring much change in eBC over the last several years. I believe that might be the case; however, the comparison is done using different measurement techniques, the PAX for this study vs. the PSAP for example, for some of the past studies. It is possible that filter-based artifacts might make this comparison less robust. In addition, even assuming eBC indeed remained unchanged, I would guess that the number of vehicles might have substantially increased over the years, so a flat eBC might still be compatible with a modest positive reduction of per-vehicle emissions. This not to disagree with the authors that a more stringent control on vehicle emission (especially diesel) should indeed be sought.

Specific comments: Section 2.2: 1. Line 15, page 12545: Moosemuller should read Moosmüller. 2. Line 19, page 12545: Does that means that there were 4 PAXs with 4 different wavelengths at the site? I think not, so be explicit that the wavelength used here was 870 nm and consider not mentioning the other wavelengths. In addition, what is the laser power? 3. Do the authors know what the potential line losses in the instrument might be? In other terms what is the transmission 50% size-cut? 4. What is the typical Q of the resonator? 5. Line 6 through 9, page 12548: does that means that the PAX used in this experiment did not have Helmholtz filters or did it? It is not clear to me. 6. A MAC of 4.74 m2g-1 is used and the Bond and Bergstrom 2006 paper is cited as a source. If I recall correctly that paper discusses the MAC for shorter wavelengths. Is the 1/lambda dependence used here to extrapolate the value at 870 nm? Please clarify. 7. Line 6 through 2 and line 16, page 12549: Beers should read Beer's from August Beer. 8. The truncation angle of 4% mentioned in the paper is estimated how and for what particle size? In addition, extinction measurements also suffer from similar issues related to the collection angle of the detector used for

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the extinction measurement and the divergence of the light source. The extinction measurement used here could be discussed a little bit more. 9. Line 18 through 21, page 12549: Considering the estimate of 4% truncation angle above, does this mean that this uncertainty should be less than 4%? 10. This type of calibration procedure seems like has been discussed previously in the literature that probably could be cited. 11. If the uncertainty on Babs is 20% then it would seem that the uncertainty on eBC should be definitely larger than 20% and the MAC can introduce substantial error as well; therefore, the estimate of eBC uncertainty of 20-30% seems a bit low. How was this range estimated?

Section 3.1: 1. I am not sure I understand the sentence "(with the exception of the SSA that is the average, not the average maxima)". This becomes a bit clearer later on in the same page. 2. Line 1, page 12553: I believe there should be no period and lower "t" after (2008). 3. Lines 1 to 7, page 12553: Stephens et al. 2008 is cited 3 times, maybe once would be sufficient. 4. Lines 10, page 12553: "displays" should be "display" probably, or otherwise "show" should be "shows" in line 24 for consistency. 5. "A decrease in SSA indicates that there is proportionally more light absorption than scattering". I think this is a confusing sentence as it seems almost to suggest that the scattering coefficient is > than the absorption coefficient in this case, meaning that the SSA would be <0.5. Obviously this is not the intent of the authors. The adverb "proportionally" seems to mitigate this issue, but I still think the sentence could be clarified. 6. Lines 5, page 12554: This implies that no other aerosol but BC is responsible for absorption, this is probably a very good assumption at 870 nm, but maybe it should be mentioned.

Section 3.2: 1. Line 12, page 12554: see comment 4 in section 3.1 for "Figure 6a-c illustrates" vs. ". . .illustrate" for consistency. 2. Line 2, page 12555: I do not think "virtual shift" is the most appropriate terminology here, because most of the human activities in the city are probably dictated by the "standardized" time and less by the "natural" time, while the changes in incoming solar radiation are obviously driven mostly by the

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"natural" time; therefore, there is in my opinion a "real shift"... 3. "...the average eBC to CO ratio on workdays was 3.5 μgm-3 of eBC to 1.0 ppm of CO. This compared to the Sunday ratio that is 2.4 μgm-3 of eBC;..." does the 2.4 μgm-3 also refer to 1.0 ppm CO? If these are ratios of eBC to CO then the units should be μgm-3/ppm(?) 4. Line 27, page 12558: Minor comment: the eBC and Babs are directly and uniquely related by the MAC chosen in this paper so eBC is not really a proxy for Babs, it is exactly proportional to eBC. 5. Line 3, page 12561: "These" what? "These observations"? Or "These conclusions"? Or "These interpretations"?...

Table 1: Is there a reason to use the world "Maxima" plural of "Maximum" while all the other parameters are singular, e.g., "Average" vs. "Averages"?

Figure 2: The text in the figure is a little bit blurry, it would be better to provide a higher resolution image. Is the Laser power monitor used for the extinction measurement during the calibration? If so, it might be good to write this explicitly in the text and in the caption.

Figure 3: "absorption" should be capitalized in the y-axis for consistency. What does the "A" indicate on the top graph near the 1.5 value on the y-axis?

Figure 4 and 5: The font-size for the y-axis number as well as the x-axes labels is definitely too small and very difficult to read.

Figure 6: Add x-axis title for consistency with the other graphs in the following figures.

Figure 8: Y axis title on top graph should read PM2.5 not PM25. Bottom graph y-axis title, the closing bracket should not be a consistent size.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 12539, 2015.