

Interactive comment on “Mexico City aerosol analysis during MILAGRO using high resolution aerosol mass spectrometry at the urban supersite (T0) – Part 2: Analysis of the biomass burning contribution and the modern carbon fraction” by A. C. Aiken et al.

Anonymous Referee #1

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Review of “Mexico City aerosol analysis during MILAGRO using high resolution mass spectrometry at the urban supersite (T0) – Part 2: Analysis of the biomass burning contribution and the modern carbon fraction” by Aiken for ACPD

In view of the large territory covered by this article I will skip the obligatory opening paragraph that says in some other words what the authors have done. Suffice it to say they have done a lot to quantify impacts of biomass burning at an urban location in

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Mexico City. By no means are all problems solved but I believe that uncertainties are better exposed. Grouping data into three 4 to 6 day time periods, two with a large BB influence and one with much lower BB impacts was a productive way of looking at the data. It is not the only way. With the exception of ^{14}C and levoglucosan measurements, the data have time resolution of the order minutes or less. Although clearly outside of the scope of the present article, I for one am interested whether the fast response data give additional insights, beyond that contained here and in Part 1.

I recommend that this article be published with minor modifications.

General Comments It is interesting that with all of the data taken during MILAGRO there is still a major gap between modern carbon measurements and quantified sources. I agree with the authors that finer time resolution measurements are needed.

Variations in CH_3CN are discussed, but in the end its origin and relation to BBOA is still ill-defined. Fig. 14a showing a pronounced diurnal cycle in the ratio of BBOA to CH_3CN was a complete surprise to me. Many observation, including ones from Mexico City (Table 2) show that CH_3CN is correlated with urban CO. Trash burning is a possibility in Mexico City but less likely in NEAQS?

How can the contribution of trash burning to BBOA be assessed? In period F3, there might have been less trash burning because of rain, which I believe is mentioned in the text. There were differences in synoptic flow which may have shifted the location of plumes away from T0.

Fire period averages of CO are about the same in F1 and F3 (Fig. 9a). Would you draw the conclusion that BB are a minor source of CO? Is there any evidence from the finer time resolution data that BB contributes significantly to CO?

Figures 15 e and f are excellent illustrations of the very different pictures obtained from surface and column data. In that regard, I am concerned that the average values presented for fire periods F1, F2, and F3 are heavily weighted towards nighttime values

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as very high concentrations of primary pollutants are found in a shallow boundary layer. I take it that average values of ratios are obtained by taking the ratio of two averages – which should be explicitly mentioned in the text.

I recommend that more use be made of Tables. For example, the ¹⁴C measurements in the present study and by Marley et al; and PMF concentrations and percentages of OA – whatever is of bottom line importance to the conclusion of this article. A Table or Tables should be introduced at the point where the data first appears. All of the numbers are in the text and in Figures. Footnotes or Table entries could cross reference Figures. The problem is that there are so many numbers that by the end of the article it is easy to lose track of where things came from.

Specific Comments

P 25925 Calculation of OCbbnf An equation would be useful

p 25928, lines 1-5 best estimate of regional influenced OOA background from 8PM to 4 AM. Has it been established that a strong regional influence would be visible within the nocturnal inversion layer? Are wind speeds at night rapid enough to see material from outside the City at T0? What do the models say about nocturnal drainage from mountain-side areas that are burning? This is of particular importance since the fire impacts are calculated to be most pronounced at night. One might expect the nocturnal residual layer to be most effected. Between 10:00 and 12:00 the boundary layer is rapidly incorporating material from the residual layer which, however, would be easily confused with formation of OOA within the boundary layer. Nighttime data from Pico Tres Pardes might be useful.

p 25928 Fire Impact Factors from FLEXPART. I am concerned that the FLEXPART results are for a column from the surface to 2000m while data that is averaged over periods F1, F2, and F3 will be most affected by high nighttime concentrations in a shallow boundary layer.

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p 25939 line 23 – p 25940, line 5 In the first page OC has important contributions from non-fossil sources, 57 and 43% during the high and low BB periods. On the second page: fossil OC represents 50 and 63% during the high and low BB periods. A stylistic point: In one case numbers are for non-fossil and in the second case for fossil. A substantive point: Numbers are not the same. Is the first statement from Stone et al?

P 25940 Fig. 12b divides OC into WSOC and WIOC It is difficult to know where to go on graphs to see this (not helped by microscopic size of ACPD PDFs). In this case, the relevant comparison is between slice that is solid purple, and slice with purple lines.

p 25941 line 2-5 WSOC and WIOC What is water soluble is an operational definition.

p25942 line 6. reference to Fig. 10 d-f. Fig 10 being in an earlier section, it was not immediately obvious that the authors were going back to the actual 10d-f, rather than presenting something new based on the methods used to construct those figures.

p 25945, line 6-7. “HCN explained 10% of the variance of ammonium nitrate” This is only a minor contribution to BB so my comment has only minor importance. HCN and ammonium nitrate will respond to common meteorological factors determining ventilation. Even without a common source, I am surprised the correlation is so small.

p 25948 line 18, NR-PM1+BC I suspect that NR was defined previously, but where? Non-refractive? Repetition of definition would be useful.

P 25948 line 18-20 Column abundances Is the residual layer assumed to have zero aerosol?

p 25949, line 24 and other places “an increase of OOA during the low fire periods” This is true but the increase is small and easily explained as natural variability. The more important point, which the authors clearly recognize, is that there is not a large drop in OOA during low fire periods which indicates that the OOA was coming from fires.

p 25965 Table 1. Biomass contributions to OC. Why does the ¹⁴C analysis indicate the same contribution of 18% for high and low fire periods.

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P 25966 Table 2 and other places in the text. When taking a ratio to CO, what background is subtracted from measured CO?

p 25969 Fig 3 a and other figures. Are date tic marks at midnight?

p 25979 and other places. Comparison of ¹⁴C measurements with other measurements Are the other measurements averaged over the collection times for the ¹⁴C samples or is the averaging done over "fire periods"?

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