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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of aging on organic aerosol from open biomass burning smoke in aircraft and lab studies" *by* M. J. Cubison et al.

Anonymous Referee #1

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This paper presents interesting data on the aging of biomass burning aerosol in the atmosphere. The subject is certainly well within the scope of ACP. However, to my feeling the authors draw conclusions that are not backed up by their data, or at least the reader can not follow the interpretation because not enough information is given. I have three major comments related to the data analysis and interpretation:

Major comments:

First:

A lot of the data analysis is based on the f44 value (ratio of m/z 44 to total organics). To calculate the aerosol contribution to the peak at m/z 44, the gas-phase background of

CO_2 has to be subtracted. In general this background is determined by filter measurements, sampling only the gas phase. In biomass burning plumes, the gas-phase CO_2 concentration is enhanced. Thus, it necessary to make this correction time-dependent, either by measuring with a particle filter several times during the plume measurement, or to take measured gas-phase CO_2 data to estimate the enhanced gas phase CO_2 contribution. In the paper such a procedure is not described, so I conclude this has not been done. Thus, the f44 data may be biased towards high values in the BB plumes

Second:

One of the major conclusions of the paper is that the f60 value of the aged Arctic-background data "lie elevated in f60 with respect to the 0.3% of OA background level" (Section 3.5) The way the authors present their data, it appears to be clear that the answer is "yes". However, if they would not use a constant mean value for the non-BB f60 (0.3%), but fit a line to the data in Figure 1, or would use only non-BB data with f44 > 0.15 for the comparison with the Arctic background f60 data, then the non-BB f60 background value would be markedly larger. Especially looking at Figure 4, a fitted line through the grey points appears to match the Arctic-background data very well. Thus I doubt that the data support the conclusion the authors draw.

Third:

For such an analysis, it is crucial to name the criteria that were used to define a "plume". However, the authors only refer to a publication by Hecobian and Weber, "in preparation", which makes it impossible for the reader (and the referee) to find out how the plumes were defined. I suggest either to wait with the present paper until the Hecobian paper is published (which might be fast if Hecobian and Weber plan to submit to ACPD, but may take much longer elsewhere) or to include a description of the criteria that were used in the present manuscript (I recommend the latter).

Minor comments

Section 3.1

Page 12114, lines 20-22

What were the altitudes of the flyovers? It makes a large difference whether they were in the PBL or in the free troposphere.

Page 12114, line 21: mention acronym LAX here (or explain acronym in the caption of Fig 1)

Also, flight dates would be useful.

Section 3.2

Page 12115, lines 2-11

Again, flight dates are missing in the main text. It should be mentioned that in Figure 2 also the time trace of total organics is shown.

Section 3.3

Page 12117, line 11

“Lake McKay plume” is mentioned here for the first time. Please give necessary information (where, when, what kind of fire, what altitude?). The flight date is given later, but only in section 3.6.

In general, a table with flight numbers, campaign names and flight dates would be very helpful.

Section 3.6

Page 12121, lines 5-12

First, I don’t understand how the global source is calculated, second, I don‘t understand the range given for the values. If the range of OA/delta_CO ranges between -0.01 and 0.07, then the range of the global OA source should reflect this uncertainty. Why has

the delta_OA/POA no uncertainty? Isn’t that inferred from the same data?

Figure 2:

The two different time scales are confusing. Either show both plots (the AOD curtain and the measured data) on the same scale. Or indicate the plume time-frames also in the measured data plot. At the end of the flight on 17/04/2008, does the smoothed curve for f60 really represent the measured data?

Figure 3:

Why are the Arctic background data not shown here?

Figure 4:

I suggest including the lines shown in the inset into the main figure and skip the small inset graph.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 12103, 2011.