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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fast airborne aerosol size and chemistry measurements with the high resolution aerosol mass spectrometer during the MILAGRO Campaign" *by* P. F. DeCarlo et al.

Anonymous Referee #2

Received and published: 15 January 2008

General comments:

This paper presents new and interesting data on aerosol chemistry measured with an aircraft-based High-Resolution ToF-AMS above Mexico City and Central Mexico during the MILAGRO project. The paper is well organized and fits well into the scope of ACP. The overall data quality is good, however, I discovered a few shortcomings, especially with respect to the description of the different measurement systems and data sources, as well as in the discussion and interpretation of the measurements.

I recommend publication after the specific comments listed below have been addressed.

Specific comments:

Title: I suggest to change the title into something more science-related, e.g.: "Fast airborne aerosol size and chemistry measurements over Mexico City and Central Mexico during the MILAGRO campagain", because the focus of the paper is on the results and not on the instrument

Methods: I miss a description of the ground sites T0 and T1. What was the instrumentation used there? Are there references on this issue? Was an identical HR-ToF-AMS used at the ground as on the aircraft? The Stone et al. (2007) paper doesn't mention an AMS, and the Aiken et al. (2007a) conference contribution is not available to the reader.

page 18273, lines 17-29: What were the flight altitudes?

page 18277, lines 18-20: Regarding the HCN measurements: Crounse et al. (2006) focus on H2O2. They do not say much about about HCN, and I couldn't find the detection limit for HCN in that paper.

page 18277, line 8: The SPS2 is not mentioned elsewhere in the paper. Were the black carbon data mentioned on page 18283 measured with this SP2? If so, please give a short explanation.

page 18280, line 12-13: Was the gas-phase CO2 fraction of m/z 44 found to be dependent on flight altitude?

page 18281: Again the T0 Supersite is mentionened, this time also with "W-mode data...". Please give a description of the measurements or a reference for these data.

page 18282, line 9: Replace "5 m time grid" by "5 min time grid" to avoid confusion with horizontal flight distance.

page 18283: The good agreement between AMS and SMPS implies that no mineral dust is found in below 1 μm. Is this expected for Central Mexico?

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page 18284, line 12: I would prefer "12:00 - 18:00" instead of "noon-6 PM" (as in the legend of Figure 3)

page 18284: Again the T0 Supersite is mentioned without further information.

page 18285, description of Figure 4: Please indicate the flight altitudes. Did the flights take place in the PBL or above? Would it be possible to present the data as averages in "grid boxes", e.g. 0.5° x 0.5° ? And leave grid points empty that contain no data? What is the reason for not including NH4 in Figure 4?

page 18285, line 24: What is "excess CO" here?

page 18285, lines 25ff: Be careful: The ratio NO3/CO shows a reduction, while the ratio OA/CO does not. The absolute concentrations of OA decrease (as shown in Figure 4)

page 18286, line 3: SOA formation? Is there evidence? If CO and OA are just diluted, the ratio will stay constant. How is the time scale for SOA formation of 1 day determined?

page 18286, line 14: "... at altitude as ..." What altitude?

page 18286, line 19 ff and Figure 6: It would very valuable to show more vertical profiles, for example one plot with data from all flights, averaged for measurements over Mexico City and off the city.

page 18286, line 20: Is the Popocatepetl always active? Or was it only active during the measurement times? Maybe one sentence on the volcano in the introduction would be helpful.

page 18287, lines 14 - 29: Please give description or reference for the optical particle instrument.

page 18288, line 9: flights "through the city": At what altitude? What is the timescale of transport of the emissions to the measurement altitude?

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page 18289, lines 22-27: The discussion is not clear: What is the reason for the increasing O/C ratio: Additional aerosol formation by SOA? This would imply that the aerosol mass increases. Then why does the ratio OA/OC remain constant? What is meant by "loss of carbon"? How and why does this occur?

page 18291, line 11: what are "day tagged CO emissions"?

page 18292, line 18: Is the reference Lee et al., (2008) work that was submitted to the conference that will be held in 2008?

Figure 2b: All error limits equal 0.01? Please check. Error limits to the slope of a regression in Igor are calculated by:

CurveFit line Data /D

print "intercept = ", W_coef[0], "ś", W_sigma[0]*StudentT(0.95, V_npnts-2)

print "slope = ", W_coef[1], "ś", W_sigma[1]*StudentT(0.95, V_npnts-2)

(from Igor Reference.ihf (Topic: StudentT))

Technical corrections:

page 18275, line 20: replace second "with" in the sentence by "and"

page 18280, line 22: "...the flight one city..." please check sentence

page 18285, line 17: "...the their..." check sentence.

page 18292, line 24: should it read "Fig. 12b and c" ?

Figure 4: only panel (c.) is denoted. The letters (a), (b), (d) are missing

Figure 5: (a), (b), (c) are missing in the figures

Figure 6: denote panels with (a) (upper part) and (b) (lower part)

Figure 11: The legend is confusing. The graph is very busy. It might help to plot the

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flight altitude into the first panel, and also include vertical lines into the plot, because the reader has to compare panels d) and a) for time periods I, II, and III.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 18269, 2007.