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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-range pollution transport during the MILAGRO-2006 campaign: a case study of a major Mexico City outflow event using free-floating altitude-controlled balloons" *by* P. B. Voss et al.

Anonymous Referee #2

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Review of "Long-range pollution transport during the MILAGRO-2006 campaign: a case study of a major Mexico City outflow event using free-floating altitude-controlled balloons" by Voss et al for ACP

This paper makes several interesting points. 1) Flow out of the Mexico City Basin can be very complicated because of wind shears. 2) Most likely, the CMET balloons identified the C130 intercepting the Mexico City plume at 3 locations. 3) Flow from the basin is decoupled from the down-sloping terrain in contrast to FLEXPART predictions. The last conclusion is mentioned briefly on page 3365 but the comparison to FLEXPART

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Interactive Discussion
Discussion Paper

is not brought up till the end of the paper. The reader is warned not to assign climatological significance to a single event. Yet, this may be the most important result of this study as it bears upon the question of how material from Mexico City influences the regional and continental scale environment. Are there connections that you can make with long range transport studies. I can't judge the importance of the Lagrangian identification of the Mexico City plume because discussion of pollutant transformations are deferred to a planned paper.

My major complaint is that it was difficult (for me) to get a mental picture of the transport patterns. Many of the figures were confusing. I recommend including a schematic diagram showing transport and shear levels. A table indicating plume interceptions and characteristics would help.

My recommendation is that the authors provide a description of transport that is clear enough for even chemists to understand. This will involve changes to text and figure. If possible, providing a broader context for decoupling would add value. The article should then be published

Comments CMET balloons are altitude controlled. They are used to follow an air mass as well as performing soundings. What constitutes following an air mass? Is there active control to keep altitude, pressure, or potential temperature constant?

p 3350, line 5-6 "populations exceeding 10 million, have grown in response to population growth.." I think I understand, but taken literally sentence is a tautology.

p 3359, line 3 SO2 signature at surface Is this at T0, T1, and T2 or at RAMA monitoring stations?

page 3359 line 6. a wind shift brought the Popocatepetl volcanic plume over the city Is this of concern to the C130 sampling in this paper, i.e. within basin boundary layer depth.

page 3361, line 4. Is 5m/s a 2 sigma uncertainty for the C130 wind speed?

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page 3364, line 24-25 “slight bulge in the temperature .. profiles centered near 2000m. I am not sure what to look at and what qualifies as a slight bulge.

page 3365 line 4 and 27 Figure 9b Typo. Specific humidity is in panel (c). Panels are not in conventional order. a and b should be on top row, c and d on bottom row.

page 3370, line 20-21 SABL imagery showing only clear air above Where should I look on figures?

page 3370, line 24 persistent wind shear Where should I look on figures?

page 3371 line 19 cool westerly jet Can you point to this on a figure?

page 3376 line 1-5. Recent findings by Subramanian (2010) show that intercepted aerosols appear to be one day old in contrast to previous estimates of a two day transit time. I can understand a reluctance to put references here, but it is necessary to cite the studies that used the questionable 2 day transit times.

Figure 7. Discussion of balloon and air mass trajectories makes frequent reference to wind shears. These are illustrated by yellow, blue and white arrows in Fig. 7. I can sort of see what is happening but my spatial imagination is not good enough to see what the shears are doing to the Mexico City plume. A cartoon of the plume showing where different pieces of it go would help.

Fig. 8. I cannot see CMET soundings. I assume this is due to small figure size in ACPD format and will not be a problem in ACP.

Figure 10. It would help the reader if the three intersections of the C130 flight track with predicted trajectories are clearly labeled on this graph. Maybe L, M, and H for altitude, or Near, Mid, and Far for distance from Mexico City. These designations would be most useful, if they were used consistently through the paper.

Figure 11. I don’t understand the figure. I assume that location corresponds to what I called Low or Near in Fig. 10. On the right and left, lidar results are below flight

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track, while in the middle it is above. Is there one laser that can be pointed either up or down? In the middle there is red layer identified as possible biomass burning. This layer appears to follow altitude of C130. Is the C130 following terrain altitude?

Figure 12. x axis is not labeled. Does it give distance along a particular direction? I'm having trouble figuring out what mesh means. It would help if e.g. identifying letters L, M, and H from Fig. 10 where put at appropriate place on C130 flight track. Are all 3 interceptions on this graph? Caption refers to trajectories (plural) from Puebla. Are these all to the left of the heavy blue line?

Figure 13. I assume that the C130 changed altitude at 2120 resulting in the change in black area on bottom of plot. Is green band on top of black area real or an artifact of poor data at a short vertical range? In caption: "The slope approximately matches the shear seen in balloon trajectories. I don't know where on graph the slope is. Nor, do I know where to look for shear in trajectories.

Figure 14a. I can't see CMET B trajectory. This should look better in ACP format. However, using a color that has more contrast with black FLEXPART trajectories would also help.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 3347, 2010.