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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evolution of anthropogenic pollution at the top of the regional mixed layer in the central Mexico plateau" *by* D. Baumgardner et al.

D. Baumgardner et al.

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Response to Reviewers

The authors would like to express their appreciation for the careful critique submitted by the reviewers of our paper and the many helpful comments and suggestions that were made to improve and clarify our presentation. Our responses are given below in the order that the reviews were received; however, given that all three reviewers shared a common concern, we will address this first.

The original intent of the study, as described in the original paper, was to describe the properties of the regional mixed layer as they related to the likely origin of the air. A case study approach was taken, similar to that used to evaluate aircraft measurements,

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in order to study specific characteristics that could be attributed to the history of the air masses. We selected cases where the air mass trajectories could be indisputably separated into three general directions, east, southeast and southwest over 24 hour periods. That being said, rather than try to convince the reviewers of the soundness of our reasoning and because of the strong sentiment expressed against this case study approach, especially that of Reviewer 1, we have instead reanalyzed the measurements finding 14 days where neither local fires or clouds and precipitation would likely alter the characteristics of the boundary layer. We have been able to use a combination of 700 mb and 650 mb meteorological fields to separate the data into three classes, i.e. air masses coming from the east, SW and WNW in order to demonstrate convincingly that the properties of the mixed layer are sensitive to the sources of the air within the region.

Secondly, all the reviewers thought that our conclusions regarding organic material coming from biomass or wood burning was stated too strongly with insufficient data to support this. We agree and have changed the text to show the importance of SOA in correspondence with the new analysis and conclusions.

As additional papers relevant to our study were published after we had submitted our manuscript, we now have augmented the presentation with reference to some of the results from these newer submissions. Finally, as suggested by several of the reviewers, we have changed the title to more succinctly reflect the content of the manuscript. The new title is <Physical and Chemical Properties of the Mixed Layer in the Region of the Central Mexico Megapolis >.

Note: Reviewers’ comments are sometime paraphrased or shortened and our responses are in <>.

Response to Reviewer 1

The charges of the ionic species are always wrong or missing.

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<Corrected>

The convention is to show the east on the right in the NH.

<The orientation of the vertical slice was chosen to correspond to the photograph of the ridge as a reference point given its orientation with east to the left.>

Units for ratios are missing at key places in the text.

<Corrected>

The biggest problem is that the authors compare their results to results from Mexico City (MC) and make conclusions about the MC plume. That does not make sense since they never measured air that originated in MC according to their Figure 3. Finally, the nearby Popocatepetl volcano and its possible effects are never mentioned even though some of the authors have published papers on this volcano!

<Corrected>

P3266, L6: why were 3 days chosen and what were the other days like?

<Corrected>

P3266, L12 - 14: 2 charges incorrect and one exponent incorrect!

<Corrected>

P3266, L18: air flow up hill at night or whats going on?

<Clarified>

P3266, last paragraph: no basis for conclusions about MC that I can see.

<Clarified>

P3274, L21: 1013.25!

<Corrected>

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P3274, L25 and 28: +3!

<Corrected>

P3275: what is relevance of large PM?

<Removed>

P3276, L10, 21, and 22: at least 4 mistakes in charges.

<Corrected>

P3276 general: discuss Popo as sulfate source.

<Modified>

P3277: what is significance of organic speciation?

<Clarified>

P3278, L24: “of” before “RML”

<Corrected>

P3279: I don’t see the point of comparing an aircraft profile on 29 March (at an unspecified time and position with respect to the RML at that) with ridgetop data from March16-19?

<The other reviewers felt such comparisons were relevant and we have retained this comparison.>

P3280: I don’t see the point of comparing aged air from Cuernavaca, Puebla, etc to fresh emissions in MC. If there is a point it needs to be developed and have all the many appropriate caveats!

<The modified paper seeks to clarify these comparisons.>

P3280, L28 units!

ACPD

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<Corrected>

P3281 Aged urban aerosol can have a OM/CO ratio similar to fresh biomass burning (BB) aerosol. Not sure how you can tell the two apart.

<No longer relevant.>

P3281-3282: the OM/CO or CO/OM from BB varies a lot so really all the ratios observed could be BB. That is not surprising since no MC air was sampled.

<No longer relevant.>

P3282, L9: define OM (earlier) and add plus or minus _0.2 to ratio.

<No longer relevant>

P3282, L25: there are fires all over MC. I doubt the Yucatan caused impacts on the days mentioned that were larger than the impacts of local fires. Get the hotspot shapefiles from the CONABIO website and overlay them on Figure 3 for any days you want to analyze. Run some back trajectories free at HYSPLIT.

<No longer relevant>.

P3282, L26: “ammonium” should be “ammonia” two different things!

<No longer relevant>.

P3283, L18: diluted from what??

<No longer relevant>

P3283, L27-28: wrong sign and justify comparison to MC (if you can).

<No longer relevant>

Fig 1. not a bad idea for background, but soundings from Mar16-19, 2006 would be better to show.

ACPD

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<No longer relevant>

Fig 3 add hotspots.

<No longer relevant>

Fig 4. unneeded.

<We respectfully disagree.>

Fig 5. reverse direction and add met patterns.

<Figure 4 and 5 combined. We believe this is relevant and does not detract from the paper’s theme.>

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 3265, 2009.