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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Biomass burning and urban air pollution over the Central Mexican Plateau" *by* J. D. Crounse et al.

J. D. Crounse et al.

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Reply to Anonymous Referee #2

We thank referee #2 for their time in reviewing the manuscript and for their useful comments. The comments have been very helpful in our manuscript revision. Original comments are shown in **bold** and responses are given beneath in normal fontweight.

1). In section 4: Implications for air quality improvement discussion. I suggest clearly separating the discussion in two parts: One on implications at regional level, and one on urban level. The urban level implication should introduce possible interaction with urban heat island and related urban canopy (see for example p. 342 Arya, Micrometeorlogy, 2nd Edition) that may help explain why some aerosols concentrations were high aloft and not so on the

surface in Mexico City.

The urban heat island effect is most apparent during the nighttime, when winds are low, the boundary layer is very shallow, and an inversion layer has been established. The data presented here were collected over Mexico City mostly in the afternoon when convection should be in full swing, with a deep, mixed boundary layer. The meteorology of the Mexico City basin is complex, and is described in some detail in Fast et al. (2007). In our opinion, the primary reason for the distribution of fire emissions over Mexico City is simply the fact the fires are mostly on the sides of the mountains, elevated above the ground level of the basin.

2). In paragraph 25 p. 2711: For health purposes yearly averages are as important as hourly or daily concentrations i.e. extreme pollution events. Discuss if fires may impact these concentrations.

Observations on the ground in Mexico City indicate that the fire influence maximizes during the night and early morning (Aiken et al., 2009). During night and morning fires generally die down, and burn less intensely. Though burning less vigorously at night, their emissions can become trapped in the shallow nighttime boundary layer, causing concentrations at the ground to reach higher levels than in the daytime. Likely, fires do contribute to extreme pollution events, at least to areas in close proximity to the fires. The estimation of the overall impact of fires to people on the ground could be estimated with the use of a high resolution 3-D regional model constrained by accurate meteorological parameters, precise fire emissions and locations, and coupled with current population maps. For example, what has already been done using WRF-CHEM in modeling of primary organic aerosols in the Mexico City region (Fast et al., 2009) could be extended to estimate the overall fire impact to persons living in Mexico City, though as stated therein, additional effort would likely be required to properly capture the nighttime and early morning boundary layer as well

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as adequate modeling of SOA growth considering anthropogenic and biomass burning.

The following text has been added to the conclusions:

"A possible method for estimating the impact of fires to people on the ground in Mexico City would be through the use of a high resolution 3-D chemical transport model constrained by accurate winds and meteorological conditions, accurate fire emissions, and coupled with population maps. For example, an extension of the Fast, et al. (2009) study could provide such an estimate, however additional work would be required to properly model the nighttime and early morning boundary layer, as well as an adequate parameterization of SOA growth which considers both anthropogenic and biomass burning precursors."

3). Another suggestion is to include a comment and reference to the paper also of the Milagro campaign in the same ACPD issue: Evaluating simulated primary anthropogenic and biomass burning organic aerosols during MILAGRO: implications for assessing treatments of secondary organic aerosols.

See response to comment #2.

Technical corrections:

1). In paragraph 5 p. 2704: Fig. 2c is referred but not included.

Corrected. Should be Fig. 2b.

2). In paragraph 25 p. 2709: Put reference from which automobile primary organic aerosols emissions data were obtained.

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Added the following references, already contained in the paper: DeGouw et al (2005) and Robinson, et al (2007).

3). Table 1: Should have a more informative heading on how to read the table, or put this information in the text.

Changed Table 1 heading to the following:

'Anthropogenic and biomass burning emission ratios derived here (TLS) and those measured directly in the Mexico City area.'

References

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 2699, 2009.

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Interactive Comment