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## ***Interactive comment on “Modeled and observed ozone sensitivity to mobile-source emissions in Mexico City” by M. Zavala et al.***

**M. Zavala et al.**

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The authors would like to thank the reviewer for the comments and suggestions of this paper. The following are response to the comments and some of the changes made in the manuscript based on these comments.

*General comments In general I find the article suitable for publication in ACP since it provides information about the state of the air pollution problem in Mexico City and possible abatement policies for the Ozone problem in the region. This information is based on an historical analysis of measurements and modeling. Especially important is the conclusion not only that historically the atmosphere in Mexico City has migrated from a NOX to VOC sensitivity, but how sensitive the atmosphere is to the emission changes. The issue about VOC sensitivity was already mentioned in Lei et al. 2006,*

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*Characterizing ozone production in the Mexico City Metropolitan Area: a case study using a chemical transport model. This reference should be included.*

[Response] In the paper we make extensive reference to the work of Lei et al. (2007) several times, as it is the basis of our sensitivity analysis.

*Specific comments The most important missing issue is whether biogenic emissions were taken into consideration, especially for the discussion about the AD domain contained in paragraph 10, page 15001.*

[Response] In section 3, page 15003 we indicate that the sensitivity studies are carried out for the gasoline fleet, diesel fleet, all mobile (gasoline plus diesel) and all emissions (anthropogenic plus biogenic). Table 1 shows that for the MCMA biogenic emissions account only for about 3% of NMHCs. The reviewer is right in pointing out that as the domain increases the influence of biogenic emissions may be larger. However, inside the MCMA and its surroundings, within which we have considered biogenic emissions, the results are still valid.

*Paragraph 15, page 15009: Increase on Diesel transportation is mentioned as possible cause for no NOx abatement, but no data supporting this fact is put forward.*

[Response] Note that in that section we list this -and other- possible explanations for the observed larger homogenization of the vehicle fleet in its CO and HC emission characteristics (that is, their reduced variability over time) but that the homogenization is not observed for NOx. A comparison of fuel sales data between 2000 and 2006 from the latest emissions inventory shows that gasoline fuel sales increased about 1.8% annually on average whereas diesel sales increased about 4% annually over that period. This has been added to the text.

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*In paragraph 10 page 15006, the sensitivity to alkenes and aromatics is rather an obvious conclusion.*

[Response] Although, arguably, it may seem obvious that the model is sensitive to alkenes and aromatics, it is perhaps of more importance the presented results on the quantification of the relative sensitivity of the various VOC emission groups between them.

*In paragraph 15 and 20 on page 14996, just to be safe: has the possible effect of summer time (beginning of April) been taken into account? This program started in Mexico around 2002. More emissions during dark conditions may have an influence later in the day? Same in paragraph 5 on page 14999.*

[Response] Yes, the summer time effect was taken into account. The program actually started in 1996. Furthermore, note that the lagging effect is somewhat smooth and between 1.5 and 2 hrs and that the transition is accompanied by significant changes in nocturnal levels.

*Figs 6 should be enlarged by dividing them in two sets per page of six*

[Response] We prefer to present the results in a single figure because it gives the reader a front view, at once, of the relative effects of the perturbations of the various emission groups.

*In paragraph 10, page 15006, is mentioned that emission of NO<sub>x</sub> has not been reduced as much as VOCs, is there any other similar case, for example Los Angeles?*

[Response] Long-term (about 35 yrs) emissions trends estimates in the US show an overall larger reduction in VOC and CO than for NO<sub>x</sub> emissions. This is attributed, in part, to differences in timing and strengthening of emission standards for CO and VOC than for NO<sub>x</sub> from mobile sources (NRC, 2006). From the same study, however,

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in the last decade such estimates show comparable reductions of the emissions of these pollutants in the US. Similarly, a recent study that compiles various results from remote sensing studies shows that CO, NO<sub>x</sub> and HC from mobile emissions all have decreased in various US cities over the last decade (Bishop and Stedman, 2008). However, a long-term study in California shows that despite the decrease of overall NO<sub>x</sub> emissions, the relative importance of diesel trucks has grown as source of NO<sub>x</sub> emissions (Ban-Weiss et al, 2008). Our results suggest that NO<sub>x</sub> emissions in Mexico have not been reduced as effectively as in US cities.

*Regarding the discussion in paragraph 15, page 15013 there is no data to sustain this assertion: according to local information traveling time increased from 45 to 60 minutes between 1994 and 2007. Source: Encuesta origen destino 1994, GDF, Encuesta origen destino 2004, GDF*

[Response] We have presented the data on figure 3 as evidence (see also our response above on similar issue).

*I found more references on modeling with MM5 in Mexico City that should be added: Jazcilevich A., A. R. García and E. Caetano, 2005. Locally induced surface air confluence by complex terrain and its effects on air pollution in the Valley of México. Atmos. Environ. 39, 5481-5489. A study of air flow patterns affecting pollutant concentrations in the Central Region of México, Aron D. Jazcilevich, Agustín R. García, L.Gerardo Ruiz-Suárez, Atmospheric S7568 Environment, 37, pp. 183-193, 2003. A modelling study of air pollution modulation through land-use change in the Valley of Mexico, Aron D. Jazcilevich, Agustín R. García, L.Gerardo Ruiz-Suárez, Atmospheric Environment, 36, pp.2297-2307, 2002.*

[Response With regards to the modeling using MM5, we specifically referred to de Foy et al. article because it describes our previous work. However, we have included

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additional references in the manuscript, including suggestion from the reviewer.

## References

Ban-Weiss, G., McLaughlin, J., Harley, R., Lunden, M., Kirchstetter, T., Kean, A., Strawa, A., Stevenson, E., Kendall, G.: Long-term changes in emissions of nitrogen oxides and particulate matter from on-road gasoline and diesel vehicles, *Atmos. Environ.*, 42, 220-232, 2008.

Bishop, G., and Stedman, D.: A decade of on-road emissions measurements, *Environ. Sci. Technol.*, 42, 5, 1651-1656, 2008.

NRC: State and Federal Standards for Mobile-Source Emissions, in: Air Quality, Emissions, and Health Impacts Overview, The National Academic Press, Washington, DC, ISBN 0-309-10151-4, 2006.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 8, 14991, 2008.

**ACPD**

8, S8789–S8793, 2008

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