

Interactive comment on “Ozone response to emission changes: a modeling study during the MCMA-2006/MILAGRO campaign” by J. Song et al.

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The authors are grateful to the referee for his/her thoughtful and thorough review, which has substantially improved the quality of this paper. Following are our responses to the comments (comments of Referee in *italic* and responses in TNR).

The manuscript studies the sensitivity of different emissions to the calculated ozone formation during the MILAGRO field experiment. The paper is well written and organized. The comparison between the model and measured result are very good, showing a very careful work by the authors. The scientific topic is interesting. The weak part is that the concept of the paper is basically following the previous works of Tie et al. [2007] and Lei et al. [2007]. However, the paper adds up some strength, especially the calculation under different meteorological conditions. This addition has scientific merit

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to publishing this paper in ACP. However, this reviewer has some important comments. The authors should address these comments prior the publication of the paper.

Specific comments;

(1) Abstract; Line 9. The words of “ozone was well reproduced by. . .” is too strong. I suggest to change to “.. fairly..”.

The “well reproduced” has been changed to “reasonably well reproduced” in the abstract, the conclusions and elsewhere.

(2) Introduction; Line 5. Ozone production is not only formed by NO_x and VOCs. CO has also important contribution to ozone production, especially in the surrounding area of MC. Please see Tie et al. [2009], ACP. By the way, this paper should be added in the reference.

CO has been included and the reference has been cited.

(3) Introduction; P23421, Line 15. The work of Ying et al. [2009] Atmos. Environ should be added in the introduction. Ying et al. tested the changes in ozone formation by changing the emission patterns in MC. Their results are important for this paper.

The following sentence has been added: “O₃ formation is also influenced by the diurnal emission pattern (Ying et al., 2009); for example, changing the diurnal variation of emissions while keeping the total emissions intact has important effects on the O₃ concentration”.

(4) Introduction; P23422, Line 15. The authors state that “.. they are rarely evaluated using arrays of aircraft measurement. . .”. This is not true. For example, Tie et al. [2009] ACP, analyzed aircraft data and compared with the WRF-Chem model calculation. Their result should be stated in the in introduction.

It is true that aircraft measurements have been used in CTM modeling studies. What we attempted to emphasize was the use of the comprehensive aircraft measurements

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due to their scarcity. The wording has been modified. We are aware of the work of Tie et al, and the following statements have been added: “During the MILAGRO campaign, a rich array of aircraft measurements of pollutants (including aerosols) were obtained, and they found their applications in evaluating model performance and interpreting the O₃ formation, evolution and transport in the urban plume from Mexico City (see e.g., Tie et al., 2009)”.

(5) P23425, Line 1. The authors should state how the lateral chemical conditions were used in the largest domain of the model. If they did not use lateral conditions, the uncertainty should be mentioned.

The chemical BC issue has been described in the text: “The chemical and boundary conditions were the same as those used in the MCMA-2003 studies (Lei et al., 2007), which were constructed based on measurements, except that they were downscaled by about 10% considering a larger model domain used in this study.”

(6) P23426, Line 6. For the emission of outside MC, the model used population distribution to construct the emissions. Why the authors did not use Marcelo's emission? What is the difference between their emission and this work?

The main reason we used the population-based emissions in the MCMA surrounding areas is in the consideration of the emission's spatial resolution. The resolution in this study is 3x3 km², while it is 12x12 km² in Marcelo Mena et al. (2009). In fact, there were many common elements in the emission construction from both sides. Both Mena and we used the population map to resolve emission's spatial distribution, the emissions that Marcelo used also considered the population distribution, and he adopted the VOC profiling data from MCE2 to speciate VOCs

(7) What is about biomass burning emission in the model?

Thanks for raising this important topic. This study did not consider BB emissions. A brief comment has been added in the conclusions: “In this study we did not include the

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biomass burning emissions. It is well known that the biomass burning emissions are an important contributor to the O₃ precursor and PM emissions, and can significantly affect O₃ levels and PM loading in the MCMA, even though their contributions are currently highly uncertain (e.g., Yokelson et al., 2007; 2009; Moffet et al., 2008; Stone et al., 2008, etc.). The effect of biomass burning on O₃ formation (and PM) and its sensitivity in the MCMA and its surroundings is an important issue, and we plan to address this in future study”.

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