

Interactive comment on “Impact of a new condensed toluene mechanism on air quality model predictions in the US” by G. Sarwar et al.

Anonymous Referee #2

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General Comments

The topics covered in this paper are extremely important to the modeling community and regulatory decision makers and meets the criteria required for publication in Geoscientific Model Development Discussions (with minor revisions).

Accurately estimating the daily maximum 8-hour ozone concentration using photochemical grid models is extremely important to the regulatory community. This paper presents a new toluene mechanism and presents the impacts on air quality model predictions. The methodology and analysis are scientifically sound. Although this new toluene mechanism does not have significant impacts on ozone and PM_{2.5} concentrations, does not alter RRFs, and does not increase OPE; the mechanism does provide a more accurate representation of toluene chemistry that does result in slightly improved

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ozone model performance.

Minor revisions include additional analyses not presented in the paper and a more detailed discussion of results. Below are a number of specific comments that should be adequately addressed before the paper is accepted for publication.

Specific Comments

Page 2292 – The introduction should include a discussion on the sources of toluene and the relative importance of anthropogenic and biogenic sources of toluene.

Page 2293, line 20 – The summer model performance statistics are much more important than the winter model performance statistics. Change “For example, CMAQv4.7 predicts O₃ with a normalized median bias of 4.0% and a normalized median error of 13%” to “For example, CMAQv4.7 predicts 8-hour maximum O₃ with a normalized median bias of 6.9% and a normalized median error of 14.5% in August, 2006”.

Page 2298, line 10-11 and Page 2311, Figure 6: It is recommended to add a second line to each chart showing the difference between the observed 8-h maximum ozone concentration and the modeled 8-h maximum ozone concentration (using CB05-Base). This would allow the reader understand how important these changes are to model performance at each monitoring site.

Page 2298, lines 20-22 and Page 2312, Figure 7: It is recommended to add the mean normalized bias (MNB) as a function of observed ozone. This would allow the reader to see how normalized performance would vary as a function of observed ozone and allow for comparison to EPA’s model performance benchmark of +/- 15% MNB.

Page 2300, lines 9-11: The sensitivity study looked at doubling toluene emissions with CB05-Base vs. CB05-TU. However, the relevance should be explained. It does not seem likely that toluene emissions will double in the future. In fact, it is more likely that toluene emissions will decrease in the future; therefore a sensitivity study that compares CB05-Base vs. CB05-TU with a 50% reduction in toluene emissions may be

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more appropriate.

Page 2303, line 10: Change text to read “CB05-TU decreases MB at higher observed O3 concentrations, and increases MB at lower observed O3 concentrations.”

Technical Corrections

Page 2292, line 11 – Change “Sensitivity study suggests...” to “A sensitivity study suggests...”

Page 2301, line 9 – Add space between “NO3” and “are”.

Interactive comment on Geosci. Model Dev. Discuss., 3, 2291, 2010.