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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying errors in surface ozone predictions associated with clouds over CONUS: A WRF-Chem modeling study using satellite cloud retrievals" *by* Young-Hee Ryu et al.

Anonymous Referee #3

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This manuscript describes the results of WRF-Chem model simulations over the continental US at 12-km resolution in which the photolysis and biogenic emissions have been improved by substituting GOES satellite clouds for the clouds produced by the model itself. Significant improvement in the high bias for ozone prediction has been obtained. In general, the paper is well written, very readable, and the quality of the science is good.

However, there are two major issues that need to be addressed before it could be accepted: 1) The analysis is based primarily on one set of model physics (Morrison microphysics and Grell 3-D convection). The authors do test the sensitivity of the results

to a second microphysics scheme (Thompson) and found little difference. However, the simulation is for summer conditions (June to September), when a significant amount of cloudiness is due to convection. Therefore, there should be a sensitivity test also run with a second convective scheme. I would suggest running the relatively new Grell-Frietas scheme. From what I have seen, this scheme will produce more clouds.

2) In Section 2.3 the authors use the delta O3 to delta NOy ratio to determine VOC-limited and NOx-limited conditions. How is delta NOy determined at EPA monitoring sites? NOy is not routinely measured at these sites. Even true NOx is measured at only some small fraction of the O3 monitoring sites. This issue needs explanation or substantive revision.

Other more minor issues are as follows:

line 127: Which year NEI NOx was too high? Did Travis et al. indicate all NOx emission types were overestimated, or was it primarily mobile sources?

lines 255 to 260: I don't follow this description of cloud fraction. Please clarify.

Section 5.5 describes in detail how the box model calculations show that OH is less sensitive to changes in radiation in the NOx-limited regime. Some statements also need to be made about the effect on P(O3) in the box model.

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