

Response to Reviewer Comments

Camilo Serrano Damha

The authors would like to thank both reviewers for their careful re-evaluation of our updated manuscript and for their constructive comments. We address the comments in the following and indicate related changes made to the revised version of the manuscript.

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1. Can the simulation names be consistent with table 1 with the addition of a “default”? Why are the default and BAT default so different?

Authors’ response: In the legend of Figure 7, the “Default” simulation refers to GEOS-Chem’s default (unmodified) complex OA scheme. The “BAT-VBS” simulation refers to GEOS-Chem’s water-sensitive (introduced) simulation that uses the OA scheme based on the BAT-VBS model. The notation “BAT-VBS - Default” corresponds to the difference between the two simulations above in terms of predicted $\text{PM}_{2.5}$ mass concentrations. The BAT-VBS simulation will always predict more OA mass concentrations than GEOS-Chem’s default complex OA scheme since RH is typically greater than 0 % in the atmosphere, leading to higher daily mean $\text{PM}_{2.5}$ mass concentrations.

Manuscript modifications: We updated the legend, caption, and accompanying text of Figure 7 to explain more clearly what “Default” simulation means and clarify that “BAT-VBS - Default” corresponds to a difference among the predicted $\text{PM}_{2.5}$ mass concentration data.

2. Add descriptive location names to fig 7 panels. Are the panels a specific point in latitude, longitude or an entire state? How were sites selected?

Authors’ response: The daily mean $\text{PM}_{2.5}$ mass concentrations displayed in Figure 7 correspond to specific geographical locations (i.e., the monitoring sites are located at specific points in latitude and longitude). We selected monitoring sites for which the daily mean $\text{PM}_{2.5}$ data were available for every day of July 2019. We chose observation stations that are far enough from each other, in different U.S. states in this case, in order to compare our simulations under different atmospheric conditions, emissions, and winds.

Manuscript modifications: We added descriptive location names to the panels to improve the readability of Figure 7. We also added Section S9 to the SI to expand on the choice of monitoring sites.

3. Add more information on the observations such as EPA network name, date of download, location of download, and any data processing to adjust or filter measurements.

Manuscript modifications: We added Section S9 and Table S3 to provide more information on the air quality monitors and associated $\text{PM}_{2.5}$ data selected.