

Response to reviewers' comments

Response to RC2:

This study investigated the uncertainties of emission controls on atmospheric oxidation and air pollutant concentrations by comparing different chemical mechanisms and inventories using an advanced CMAQ model. The manuscript is well-organized, clearly written, and the conclusions are well-supported by the presented data. These findings are timely and provide valuable insights for designing effective region-specific emission control strategies. I recommend this manuscript for publication in ACP after addressing the following minor revisions.

We appreciate the reviewer's feedback on the manuscript, and we carefully reviewed the comments and addressed each individually below, highlighting changes made in the revised manuscript.

Minor suggestions:

Line 28: Since the full name of SIA has already been introduced, the abbreviation can be used directly here.

SIA (Secondary Inorganic Aerosol) is spelled as suggested.

Lines 181-183: The statement "Note that OLE and TRP1 emissions are for the S11 mechanisms" is somewhat unclear. The authors should rephrase this sentence to improve clarity.

The sentence has been changed to "Note that OLE and TRP1 emissions are from the S11 mechanisms".

Lines 241-243: The criteria suggested by the US EPA are better to be stated in the text for clarity.

The criteria for O₃ are ± 0.15 for MNB and 0.3 for MNE. The sentence has been changed to "...within the suggested model performance criteria ($MNB \leq \pm 0.15$ and $MNE \leq 0.3$) by Emery et al. (2017) in most regions."

Lines 246-247: The current justification appears weak. The authors should revise this sentence.

The sentence in question is a bit vague, it is revised to "The underestimation of PM_{2.5} predictions using REAS in the PRD, as shown in Figure S5, is likely related to biases in this inventory specific to this region."

Lines 257-258: The authors attribute high O₃ levels over water bodies to lower O₃ dry deposition velocities over the ocean. Is there existing literature supporting this argument? A reference is needed here.

References are added to the sentence.

Line 274: The full term for SIA should be provided upon its first appearance in the main text. In addition, Figure 7 should explicitly list the SIA components for clarity.

The SIA is spelled out in the revised manuscript. The caption of Figure 7 is updated.

Lines 494 and 497: Since O₃-8h and SIA have been previously defined, the abbreviation can be used directly without reintroducing the full terms.

This is corrected.

References

Emery, C., Liu, Z., Russell, A. G., Odman, M. T., Yarwood, G., and Kumar, N.: Recommendations on statistics and benchmarks to assess photochemical model performance, Journal of the Air & Waste Management Association, 67, 582–598, <https://doi.org/10.1080/10962247.2016.1265027>, 2017.

