

Response to Reviewer Comments

“Explanation of the SAPRC mechanism: In Lines 127-139, the explanations for SAPRC are fully provided, allowing us to understand the content. However, without these introductions, we can still refer to Lines 79-84 and Lines 107-111. I would like to kindly request a brief introductory section for wider readers.

Response: The text on lines 79-84 is a summary of previous research, which used the SAPRC mechanism. The description of SAPRC mechanisms on lines 127-139 provides some key aspects of the SAPRC mechanism that are more suitable to be included in the methods section for readers who are unfamiliar with the SARPC mechanism. We feel this information is better included in the methods section than in the introduction section. Thus, no changes were made regarding this comment.

Additionally, I noticed that the Introduction mainly focuses on the emission inventory and its mechanism specific to this study. Could you clarify the motivation and purpose of this study? I expected that other aspects, such as meteorological conditions and deposition, would also contribute to uncertainty in the modeling. For example, have there been any previous studies that have shown that the uncertainty in emissions and related mechanisms is a key factor? It is recommended to revise the Introduction accordingly.

Response: The impact of meteorology uncertainties on air quality model predictions of ozone and PM_{2.5} has been studied by Gilliam et al. et al. (2015) and Wen et al. (2025), respectively. In the revised manuscript, we added citations to Gilliam et al. et al. (2015) and Wen et al. (2025), on lines 53-55.

In the original manuscript, we have already clearly pointed out that the motivation of this study is to understand the combined effects of uncertainties in chemical mechanism and emission inputs to predicted air quality, which has not been quantified before (page 5, lines 115-118). In the revised manuscript, this motivation is pointed out more clearly.

Please carefully review the tracked version (ATC1.pdf) during this revision process. The incomplete highlights in this review caused delays in seeing responses and corresponding changes in the main text.”

Response: Thanks for pointing this out. We highlighted the changes in the manuscript clearly in this round of revision.