Author Responses to Reviewer #2's Comments

The authors have made many significant improvements to the manuscript, and addresses many of the comments in my previous review. I appreciate the authors works, and I am satisfied by the responses. Overall, I support publication. I have also made a number of comments on the new content that I think will help to clarify the material and Figure.
We would like to thank the reviewer for the thoughtful and insightful comments, which improved this manuscript. We have further revised the manuscript according to the reviewer comments.

General comments
Pg 6 line 32-Pg 7 line7: The use of different analytical methods for land-based and shipborne OVOC measurements introduces uncertainty and makes direct comparisons less robust. Please provide a more nuanced discussion of the limitations posed by different OVOC measurement techniques in manuscript.
Response: We did not directly compare land-based and shipborne measurements, as we are aware of such intra-instrumental differences. The goal of this paper is to reveal VOC representation in the model; therefore, we compare multi-platform observations individually with model rather than among the observations themselves. To address the limitations posed by different OVOC measurement techniques, we have added the statement, "**Different OVOC measurement techniques can introduce uncertainties (Cui et al., 2016; Wisthaler et al., 2008)**". We also referenced our peer reviewed publications which provides detailed comparisons between instruments: "**readers interested in detailed QA/QC methodologies are recommended to refer to the Supplement Text or the original publications listed above**".

Pg 25-Pg 28: I think the Section Conclusion is overly lengthy. Would suggest summarizing and condensing some of the text. For instance, comparisons or references to existing studies should not be presented here. Additionally, the manuscript clearly shows the model underestimates OVOCs but does not sufficiently discuss the specific reasons (emissions vs. chemistry), leaving a gap in the narrative. Please clarify the potential causes of model OVOC underestimation.
Response: Following reviewer suggestion, we have now trimmed the text by removing unnecessary content and references. Reasons are discussed in third paragraph of Conclusion Section.

Specific Comments
Pg1 line 3: Please check the full name of the "NMHCs".
Response: Revised as suggested.

Pg1 line 27: Please check "VOC" here, maybe it should be "VOCs".
Response: Revised as suggested.

Pg 6 line 22: Please check the full name of the "MSD/ESD/FID" have appeared in the previous text.
Response: Revised as suggested.

Pg 6 line 28: Please check the full name of the "UHPLC /UHPLC-MS" have appeared in the previous text.
Response: Revised as suggested.

Pg 9 Fig.1: Please add the east longitude and north latitude on the coordinate axis of the Fig.
Response: Revised as suggested.

Pg 12 Fig.2: "NO2 and O3" Please note that the numbers here should be subscripts.
Response: Revised as suggested.

Pg 14 Fig.3(c), (f), (i): Please add more subdivisions on the horizontal and vertical axes, where the horizontal axis should correspond to at least the data for each month. The resolution of the data in the graph is not monthly. It is recommended to replace the current presentation with a date or better format. And bold data lines on the graph would be better.
Response: Revised as suggested.

Pg 15 line 14: Please check OPF here should be OFP.
Response: Revised as suggested.

Pg 17 Fig.5: Please add more subdivisions on the horizontal and vertical axes.
Response: Revised as suggested.

Pg 18 Fig 6: Please add more subdivisions on the horizontal and vertical axes. “NO2 and O3” Please note that the numbers here should be subscripts.
Response: Revised as suggested.

Pg 18 Fig 7: It is difficult to understand just giving the abbreviations of species, and the difference in color between different species is not significant, and it is recommended to use the same color for same composition group VOC species. It is also suggested to rearrange each species in an order (composition or concentration).
Response: We have now added full names for each species and reorganized them by VOC sub-groups from alkanes, alkenes, alkynes, terpenes, aromatics, aldehydes, and ketones. We compared this color scheme with the option of color-coding by VOC sub-groups and found that the current scheme offers clearer visualization, so we have decided to retain it.

Pg 23 Fig.10: Please add the east longitude and north latitude on the coordinate axis of the Fig.
Response: Revised as suggested.

Pg 23 Line 3: Please check the full name of the “VCDs” have appeared in the previous text.
Response: Revised as suggested.

SI:
Pg 4: Fig.S3: The thickness of the horizontal axis lines on the graph is not uniform, and add more subdivisions on the horizontal axes will be better.
Response: Revised as suggested.

Pg 5 Fig.S4: Please add more subdivisions on the horizontal and vertical axes.
Response: Revised as suggested.

Pg 6 Fig.S5: Please add more subdivisions on the horizontal and vertical axes. “O3” Please note that the numbers here should be subscripts, and “VOC” should be VOCs.
Response: Revised as suggested.

Pg 6 Fig.S6: Please add the east longitude and north latitude on the coordinate axis of the Fig. Same as Fig.S11-13.
Response: Revised as suggested.

Pg 7 Fig.S7: Please add more subdivisions on the horizontal and vertical axes. The range of the vertical axis on the Fig. S7(a) should start from 0.
Response: Revised as suggested. We intentionally set the starting value of the y-axis to 20 in (a) for better visualization.