

Dear Editor and Reviewers,

Thank you for accepting our manuscript with technical corrections. We are grateful for the opportunity to make revisions to our manuscript once more and thank Reviewer #2 for the insightful feedback provided in this round of review.

Below, you will find our detailed point-by-point responses to their comments, with our replies indicated in blue text. To streamline your review process, all modifications made to the manuscript have been highlighted.

Thank you again for your consideration and support.

Sincerely,

The Authors

Review 1 - Point-by-Point Response

General Comments:

There are important improvements in the manuscript, especially that stratospheric ozone is now shown separately in Table 3 with a common domain and that the figures showing vertical profiles have now a common top level. However, I still do not understand, why every model has a different vertical axis in Figures 2, 4, 5, 6 and S1 to S7. This is annoying for the reader, a common log pressure axis would be much more convenient. Usually every model has a different vertical resolution in the boundary layer near the surface but this should be not the focus of the figures and is also not mentioned in the text or captions. If the authors have software problems for graphics this should be mentioned in the reply. The paper might be published with the bad style of the figures in that case but it would be better to improve it to the standards first.

We appreciate the reviewer's concern about the varying vertical axes across models in these figures. We understand this may affect readability and would like to clarify the technical reason behind this presentation.

The different vertical axes reflect the fact that each model provides data on its native vertical coordinate system with unique pressure level definitions. The models in our multi-model ensemble use different vertical resolutions and pressure level configurations as part of their fundamental model architecture. When we downloaded the data from the model archives, each model's output was on its own specific set of pressure levels, which cannot be directly altered without interpolation.

We chose to preserve each model's native vertical grid rather than interpolate all models to a common pressure axis for the following reasons: (1) interpolation would introduce additional uncertainty into the vertical profiles, particularly in regions with sharp gradients; (2) presenting data on native model levels maintains the integrity of the original model output; and (3) the key

scientific comparisons we emphasize—the magnitude and shape of the vertical profiles across models—remain clear despite the different vertical sampling.

However, we acknowledge the reviewer's point about reader convenience. We have now ensured that all figures use consistent pressure ranges (top and bottom levels) across models, which we believe addresses the most important aspect of visual comparison. We have also added a note in the figure 2's caption clarifying that each model is shown on its native vertical grid to preserve data integrity. "Note: Each model is displayed on its native vertical pressure levels to preserve data integrity without interpolation, as applies for all related figures thereafter."

Specific Remarks

Table 1: '(number of gridpoints)' should be under 'resolution' in the header of the second column. To provide the product in a separate column was not requested.

Thank you for your willingness to help us improve the integrity of our research. Here it has been modified.

Line 216: Natural background for CH₃Cl should be about 0.5 ppbv from wildfires etc and CH₃Br about 5 pptv from oceanic sources, check and be more quantitative here.

We have added the radiative forcing of halocarbons affecting ozone in the pre-industrial atmosphere by citing relevant literature.

Table 2: Is CESM2-WACCM really without PiClim-control? If yes this should be mentioned in the captions of Fig. 4-6.

Thank you, the Piclim-control experiment data of the CESM2-WACCM model is unavailable and has been marked in the annotations of Figures 4-6.

Line 292 (caption of Fig.1): 'tropospheric' is missing.

Thank you, we have added it.

Line 271, 287, 308: What is PiClim here? PiClim-control or some average? Refer to Table 2?

The average values of the five experiments that all four models have are used, and it has been marked.

Line 332: Better write now here 'stratospheric and tropospheric'.

Thank you, we have added it.

Line 333: Replace 'global' by 'stratospheric'.

We have modified it.

Line 386: Typo.

Thank you, we have modified it.

Line 455: 'Five experiments' meant?

Thank you, we have modified it.

Figure 6c, label of vertical axis: Wrong symbol. Better write ' 10^{-12} ' instead of ' e^{-12} ' (^ means superscript).

Thank you, we have modified it.

What is 'SI file' in the reply to my remark to line 470? The data file mentioned in 'Data availability'? If yes, please refer to it at the end of section 3.3.

Thank you for pointing this out, we have indeed forgotten to mention the supplementary information file in our main manuscript, we have referred to it at the end of section 3.3, and now the text reads, “The vertical variation characteristics of ozone chemical production, chemical consumption, nitrogen oxides, and VOCs in the other seven experiments of the four models are characterized in the supplement file (Fig. S5, S6, and S7).”