This study analyzed changes in the global tropospheric ozone budget, as well as the spatial-temporal variations of surface O_3 in East Asia. It investigated contributions from regional emissions, intercontinental transport, and climate changes in a scenario where emissions of O_3 precursors are reduced under future net-zero emissions policies based on CESM. The findings reveal that emission reductions led to a decrease in tropospheric O_3, while climate changes had only a minor impact. Additionally, the contribution of biological sources to surface ozone showed a gradual increase. The research underscores the significant co-benefits of net-zero policies targeting climate change in addressing surface O_3 pollution over East Asia. I recommend that this article be published with some minor modifications.

Response: We appreciate your time and effort for evaluating our work. We have made corresponding changes and revision in the updated version of the manuscript. To address the reviewer's comments in an organized manner, we have numbered the questions, and our responses are highlighted in blue. The reviewer's comments are presented in black. When referring to the manuscript, it is italicized.

Specific Comments:

1. Line 109 and Line 122: CESM has be clarified in Line 99, it can be abbreviated directly.
Response: Thanks for your suggestion. CESM are abbreviated directly in Line 110 and Line 123 in the updated manuscript.

2. Line 137: Should be “Modern Era Retrospective analysis for Research and Applications, version 2 (MERRA2)”
Response: Yes, we missed “version 2“. It is added. Please refer to Line 137 in the updated manuscript.

3. Line 132-133: Why didn’t you use CESM1 for both online and offline simulation.
Response: CESM2 contains more chemical species and chemical reactions, and stratospheric chemistry is included, which can be used to illustrate the changes in the contribution of emissions to stratospheric chemistry and stratospheric-tropospheric-transport. CESM2 is superior to CESM1 and is a better choice for research. However, tagging methods are only introduced to CESM1. Therefore, we have to use CESM1 for online simulation. In addition, we compared the offline simulation results of CESM2 and CESM1 in present day. There was no significant difference in the distribution of tropospheric ozone (Figure R1), especially for surface O_3. So we used offline experiments of CESM2. We gave the explanations in the text. Please refer to Line 129-133.

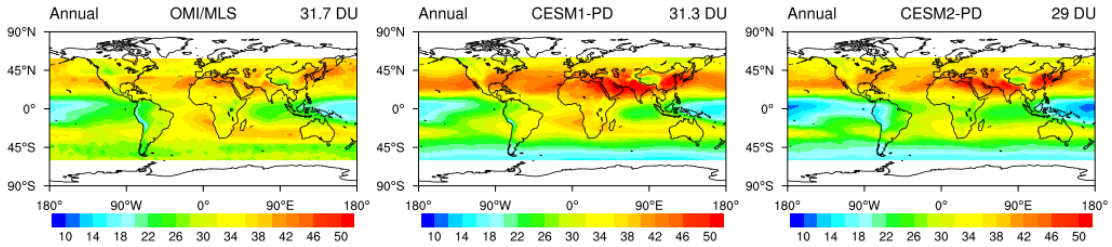

Figure R1 Annual tropospheric column O_3 (DU) from OMI/MLS (left), offline CESM1.2.2 (middle) and offline CESM2.2.0 (right) simulations under present day conditions.

4. Section 2.3: Ensure consistent tenses throughout Section 2.

Response: Thanks for your comment. We checked and revised the tenses in the whole updated manuscript.

5. Line 267-268: This explanation is confusing. A Longer chemical lifetime of stratospheric O_3 may reduce its contribution to tropospheric ozone burden.
Response: This is an ideal assumption. If the amount of stratospheric O_3 entering the troposphere and the amount of tropospheric ozone do not change, the longer the chemical life of stratospheric ozone entering the troposphere, the higher the cumulative amount of stratospheric ozone will be. This is the result that only considering the changes in the lifetime of stratospheric ozone after it enters the troposphere.

6. Line 272-273: How can weakened outflow reflect reduced regional production.
Response: Yes, it is improper to say weakened outflow reflect reduced regional production. This sentence is rewritten in the text (Line 271-273).
"*The negative 'Residual' budget term for East Asia indicates that East Asia is a net outflow region for tropospheric O_3, and this outflow is weakened in the future, from 89 Tg(O_3) yr^{-1} under present day conditions to 38 Tg(O_3) yr^{-1} under net zero.*"

7. Line 311: Another similar table to Table 2, showing different results in winter and summer could support your attribution here.
Response: Thanks for your suggestion. It is a comparison between present day and net-zero. The decrease of NOx in month can be seen from Figure 6. We rewrite this sentence in the text (Line 311-312).
"This increase in surface O_3 is caused by a weakening of titration under lower regional NO emissions in the future."

8. Line 326-328: Can you explain why temperature increase and circulation enhance in the future? I think temperature should decrease in a net zero scenario.
Response: According IPCC AR6 and the interpretation of Zhou (2021), the temperature in 2060 still is increased compared with present day, through it will decrease after 2040 under SSP1-1.9 scenario. The increase of air temperature will enhance the movement of atmosphere. In the future, the circulation may be enhanced, which has been mentioned by Sudo et al. (2003).

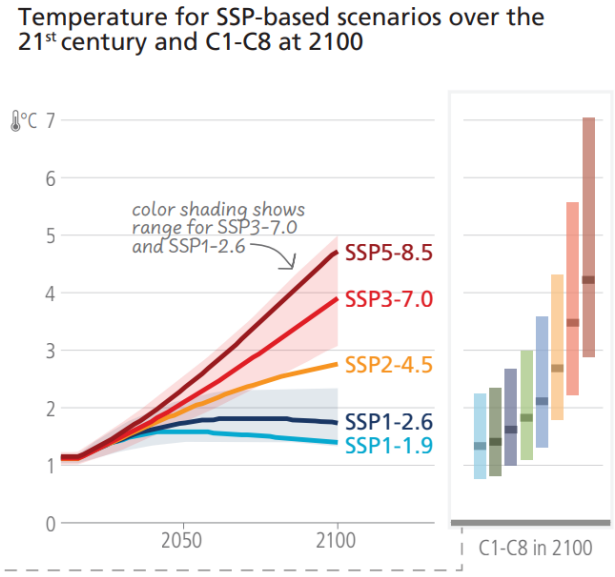

Figure R2 Global surface air temperature changes from CMIP6 historical and scenario simulations (Source: IPCC AR6).

Zhou, T. J., Chen, Z. M., Chen, X. L. et al.: Interpreting IPCC AR6: future global climate based on projection under scenarios and on near-term information, Climate Change Research, 17(6): 652-663 https://doi.org/10.12006/j.issn.1673-1719.2021.239, 2021.

Sudo, K., Takahashi, M., and Akimoto, H.: Future changes in stratosphere-troposphere exchange and their impacts on future tropospheric ozone simulations, Geophys. Res. Lett., 30(24), 2256, https://doi.org/10.1029/2003GL018526, 2003

9. Figure 6(c) and (d) shows the NOx and O_3 chemical tendency, the explanation of the ordinate 'rate' needs to be clarified in more detail.

Response: We added an explanation about the relationship between O_3 chemical tendency and "Rate" in the updated manuscript (Line 358-359).

"*The net O_3 chemical tendency is net photochemical rate of O_3 change (kg/s).*"

10. Line 373-374: Are there any evidences from your simulations that can support this explanation?

Response: We have some evidence. As shown in Table 4, the photochemical loss of tropospheric O_3 is slower and the lifetime is longer in the future. The enhanced stratospheric circulation can be seen from Figure 5. These can support our explanation in this study. For more evidence, more detailed experiments should be done in the future.