Reply to Reviewers

We sincerely appreciate all the reviewers for their constructive comments to improve the revised manuscript. The technical correction suggested by the second reviewer is reproduced below followed by our responses in blue. The corresponding edits were also added to the latest manuscript.

Reviewer #2:

General Comments:

The authors have reasonably addressed my comments. They acknowledged that none of the CMIP6 models include the mechanistic scheme of IEPOX SOA formation, and that the correlation they see between IEPOX SOA and sulfate in the models could be due to simultaneous production of sulfate and OA (from fossil emissions and/or photochemistry).

The resulting implications is that the trend between OA and sulfate in SE USA seems to be driven by confounding factors that cause them to be correlated at least in the models used and not through the known mechanistic relations between IEPOX SOA and sulfate. Using the trend between OA and sulfate (even after detrending) is not convincing enough to call it IEPOX-SOA. This caveat needs to be clearly acknowledged in the Conclusions.

Response: We are aware of the limitation of the methodology used in the manuscript to derive IEPOX-SOA based on the linear relationship between OA and sulfate. We pointed it out in the manuscript in Line 247-250 "It is noted that the approximation of IEPOX SOA here is the upper limit of BSOA since other processes that can lead to the simultaneous changes of sulfate and OA, such as wildfire, are miscounted as BSOA in the calculation. Further analysis is needed to attribute the changes of SOA to different sources more accurately". In the model evaluation, we intend to highlight the model deficiency of lacking the aqueous SOA formation, which explains their poor performance in predicting OA enhancements under droughts. As suggested, we further added the caveat of the method to the conclusion section in Line 403-404.