

Atmos. Chem. Phys. Discuss., author comment AC1  
<https://doi.org/10.5194/acp-2021-564-AC1>, 2021  
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## Reply on RC1

Yangyang Liu et al.

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Author comment on "A novel pathway of atmospheric sulfate formation through carbonate radicals" by Yangyang Liu et al., Atmos. Chem. Phys. Discuss.,  
<https://doi.org/10.5194/acp-2021-564-AC1>, 2021

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Dear Referee 1,

Thanks for your valuable suggestions, which greatly helped us to improve the manuscript. According to your comments, we have noted the flaws and shortcomings in the argument, especially for the controversial role of carbonate ions in sulfate formation under irradiation. We thus supplied a series of experiments to further improve and modify the reaction scheme proposed in the previous submission, and revised the manuscript to provide more convincing explanations to the readers. Besides, the role of superoxide radical ions, more precisely the sink of photo-generated electrons and its contribution to sulfate formation relative to carbonate radical ions have been discussed in the revised version of the manuscript. Further, we supplied a more detailed discussion to connect each paragraph on a common string of reasoning, which will guide the readers to capture the whole picture of the manuscript and to get the take-home message. We carefully consider all your comments posted to the previous version of the manuscript, and the detailed point-by-point revisions are presented as attached.

Thank you very much for your consideration.

Sincerely,

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Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2021-564/acp-2021-564-AC1-supplement.pdf>