Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC2
https://doi.org/10.5194/acp-2021-906-RC2, 2022

Comment on acp-2021-906

Anonymous Referee #2

Referee comment on "The pathway of impacts of aerosol direct effects on secondary inorganic aerosol formation" by Jiandong Wang et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-906-RC2, 2022

This manuscript presents a model-based analysis on aerosol-radiation-boundary layer interactions and feedbacks, with a focus on secondary sulfate and nitrate formation under polluted conditions. The topic is original and the paper appears scientifically sound. I have a few, mostly minor, issues to be considered before acceptance of this paper for publication.

Scientific issues:

Main main comment concerns the structure of section 3. Now there is three longish paragraph discussing sulfate formation, then two short paragraphs on oxidants and AOD, and finally something about nitrate formation. I wonder whether this is the best way of presenting the results for a reader to easily follow the discussion. Furthermore, there appears to be some unnecessary repetition of text in this section. For example, the relative roles of ADEP and ADED in forming sulfate in summer and winter is discussed in three places (lines 146-147, 159-161, 183-184).

Related to the previous comment, the authors refer to section 3.2 on lines 201 and 206, a section which does not exist. I wonder whether some earlier versions of this paper have had structure different from the current one.

The list of compounds given on line 192 certainly participate in atmospheric oxidation reactions, but not all of them (e.g. NO2 and HNO3) can be considered as oxidants. Please reword and modify this part of the text accordingly.

Essentially the same thing is stated on lines 230-231 and 235-236. Please avoid

repetition. Also, I would suggest some rewording: …more complicated than its impact on primary aerosol.

Minor technical issues:

line 48: … observations…

section 2 title should read "Methods"

line 127: The PBL height …

lines 135, 137 and 138: in the near-surface layer

line 185: … effect on …

line 207: diffuse solar radiation

Figure 8 is referred to before Figure 7. Please check out that they are referred to correctly in the paragraph on lines 212-227. If necessary, change the order of figures such that they are referred to in correct numerical order.