

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2021-119

Anonymous Referee #1

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Referee comment on "Impacts of aerosol–photolysis interaction and aerosol–radiation feedback on surface-layer ozone in North China during multi-pollutant air pollution episodes" by Hao Yang et al., Atmos. Chem. Phys. Discuss.,  
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Yang et al. examined the impacts of aerosols on surface ozone through the two well-known pathways, i.e., aerosol-photolysis interaction and aerosol-radiation feedback. The novelty of this study is its focus on the polluted episodes with elevated both PM<sub>2.5</sub> and ozone levels over North China. They also quantified the chemical and physical processes that drive the aerosol-radiation interactions.

Overall, this is a timely study and it clearly demonstrates the impacts of aerosols on ozone pollution. The structure of this manuscript is easy to follow. Although some of the manuscript needs further clarification, the results are generally convincing. As such, I think it is publishable after the following issues are addressed.

-In Abstract: ozone changes refer to MDA8 ozone or daytime ozone?

-Line 177: a correlation coefficient of 0.66 reads like not high!

-Lines 179-181: the oxidation of SO<sub>2</sub> by NO<sub>2</sub> in aqueous aerosols is important for summertime?

-Lines 248-251: this statement looks reasonable here, but in the later text the process analysis shows that chemistry will be enhanced by ARF. Instead, ARF decreases ozone through physical processes.

-Line 260: "is" should be "are". Please do proof-reading throughout the text.

-Line 310: It is Okay to use model levels (e.g., 12 levels), but it will be better to add model height in meters as well.

-Lines 326-327: why do you need this statement?

-Lines 327-328: Please provide evidence to support this conclusion.

-Discussion. I think the authors should do some comparisons between your results with previous studies. This is important for readers to better understand your case study results. Moreover, how about the applicability of the calculated ROP of  $-0.14 \text{ ppb } (\mu\text{g m}^{-3})^{-1}$ ?

-Fig.2: It will be better to add error bars for observed PM2.5 and ozone.

-Fig.3: what are the cities these plots for?

-Fig.7: what are the layers your process analysis applied for? I don't see this key information here, as well as in the text.