

Atmos. Chem. Phys. Discuss., referee comment RC2  
<https://doi.org/10.5194/acp-2021-727-RC2>, 2021  
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## **Comment on acp-2021-727**

Anonymous Referee #2

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Referee comment on "Distinct impacts on precipitation by aerosol radiative effect over three different megacity regions of eastern China" by Yue Sun and Chuanfeng Zhao, Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-727-RC2>, 2021

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This manuscript reports on the distinct impacts on precipitation start/peak time by aerosol radiative effect over three different megacity regions of eastern China, which is found mainly caused by the different aerosol concentration and types over the three regions. The manuscript argues that the precipitation start time is 3 hours advanced in North China Plain due to high proportion of absorbing aerosol, 2 hours delayed in Pearl River Delta due to high proportion of scattering aerosol and negligible changed in Yangtze River Delta. The authors found that the period with the most occurrence frequency of precipitation start time is delayed and prolonged by aerosols over North China Plain, and discussed the response to precipitation to aerosol under different meteorological conditions. With the very interesting and valuable findings that include but are not limited to the parts I mention here, I believe this study is very important contribution to the science community regarding the aerosol-precipitation interaction.

Some minor comments

Line 60: "with the increase of the aerosol" should be "with the increase of aerosol"

Line 86-87: "in the initial stage" should be "at the initial stage", "in the development stage" should be "at the development stage"

Line 114-115: I would suggest adding a reference for topographic rain effect.

Line 134-135: I would suggest changing the description to "at a vertical interval of 125 meters"

Lines 140-141: Please provide a brief description about the method to classify the convective, stratiform, and other precipitation types.

Line 174-181: The authors attempt to find suitable indicator as a proxy for CCN and they select 4-hours mean PM2.5 mass concentration before precipitation to investigate the impact of aerosols on precipitation. Why do not the authors choose 5-hours mean PM2.5 mass concentration before precipitation or the PM2.5 mass concentration during the precipitation to represent the CCN?

Line 187: I would suggest changing the description to "The low troposphere stability (LTS) can ..." to define LTS.

Line 199-200: I would suggest changing "have contributed to" to "have been used by"

Line 203: I would suggest changing "on different pressure levels" to "at different pressure levels"

Line 220-222: It seems the description here is wrong. I believe the correct description should be "Second, we rank the PM2.5 mass concentration observations from high to low, and define the top 1/3 of group C as polluted condition and the bottom 1/3 group C as clean condition."

Line 240: "The diurnal variations" should be "The diurnal variation"

Line 250: I would suggest changing "make" to "making"

Line 288: I would suggest changing the description here from "the PDFs of the precipitation duration time and when the peak time occurs after start time" to "the PDFs of the precipitation duration time and the time difference between precipitation peak and start time"

Line 416: I would suggest adding "that" after "show" here.

Line 531: "are" should be "is", corresponding to "response".

Line 590: "which are essential for improve our understanding" should be "which are essential to improve our understanding"