

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2021-727

Anonymous Referee #1

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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-RC1>, 2021

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Review of "Distinct impacts on precipitation by aerosol radiative effect over three different megacity regions of eastern China" by Sun et al.

The manuscript "Distinct impacts on precipitation by aerosol radiative effect over three different megacity regions of eastern China" mainly studies the influence of aerosol on the start and peak time of precipitation over three different regions, the North China Plain (NCP), the Yangtze River Delta (YRD), and the Pearl River Delta (PRD). In general, the paper is well written and presented in a logical way. It is a timely and important piece of work, and of general interest for Atmospheric Chemistry and Physics related communities. I therefore recommend publication of this paper in Atmospheric Chemistry and Physics after minor revisions. My comments are listed as follows:

### Specific Comments:

- Lines 158-160: If precipitation occurs in the troposphere and is more affected by aerosols below cloud bases, why is the column-integrated aerosol amount (AOD) not suitable but ground-based observations of  $PM_5$  are more suitable?
- Lines 160-165: Perhaps the authors' opinion is that  $PM_{10}$  is more suitable for studying larger particle aerosols such as dust, and there are fewer large particle aerosols in the three selected research areas, so  $PM_5$  is more suitable than  $PM_{10}$  in this study. A clearer description is needed here. And what does "100 nm" represent?

- Lines 177-179: Why can the previous phenomenon suggest that “it is not suitable to use  $PM_{10}$  mass concentration or AOD at a given moment to examine the influence of aerosol on precipitation”?
- Line 180: Why do the authors select the 4-hours mean  $PM_5$  mass concentration before precipitation to investigate the impact of aerosols on precipitation? The relationship between daily mean  $PM_{2.5}$  and 4-hours mean  $PM_{2.5}$  mass concentration before precipitation, similar to Figure 1, is needed.
- Line 189: What is the full name of LTS?
- Line 219: The authors regard  $PM_5$  that is greater than 2 times the standard deviation as abnormal values and remove it, which could lead to mistakenly remove some heavy pollution conditions as abnormal values. Is it reasonable? And what is the proportion of the sample size that is eliminated as abnormal values in the total sample?
- Lines 344-355: I think it suggests that the aerosol has caused the secondary crest of precipitation peak time 1 hour delayed.
- Lines 422-424: The information of “the crests of the stratiform precipitation start time are at 19:00 and 17:00 LT under clean and polluted conditions in the afternoon, respectively” cannot be gotten from Figure 7f. It likely to be 20:00 and 18:00 LT under clean and polluted conditions, respectively.
- Line 429: I think they are 14:00 and 16:00 in NCP from Figure 8a.
- Lines 527-529: Please clearly indicate which figure and which situation are aimed at.