

## ***Interactive comment on “Anomalous holiday precipitation over southern China” by Jiahui Zhang et al.***

### **Anonymous Referee #1**

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This manuscript examined anomalous precipitation changes around the Chinese Spring Festival (CSF) and associated temperature, humidity and circulation changes using extensive station data and the ERA-Interim reanalysis. The results showed that the precipitation tends to decrease during the CSF holiday, and pointed out that the change is mainly caused by the humidity decrease associated with an anomalous cyclone circulation. The results are very interesting, especially given that the ERA-Interim data present similar changes in the surface precipitation. However, the authors tried to attribute all these changes to the aerosol decrease due to the economic slowdown without giving persuasive proofs. I cannot agree to this part. The cause-effect relationship between aerosol and precipitation changes cannot be concluded from current results. I suggest a major revision to Introduction and Section 4. Currently they could

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be misleading for readers.

1. Page 1, Line 19, 'lower water vapor' → decreased water vapor; Line 21, 'When the precipitation days exclude the mean . . .' this sentence is confusing.

2. The authors emphasized aerosols too much throughout Introduction. Although the authors did not state it clearly, it still feels as if aerosol changes associated with human activities could explain all changes presented in the main text. This is misleading. I suggest the authors emphasize human impacts on weather and climate at diverse spatial/temporal scales rather than aerosols in this section.

3. While this manuscript focused on southern China, are there any changes in precipitation over northern China? Since Gong et al. 2014 showed the cooling during the CSF holiday spreaded over both northern and southern China. It will be better if the authors could give some information on this aspect in the discussion.

4. Page 9, Line 6, what does 'higher' mean here?

5. Page 10, Line 5, and somewhere else in the manuscript, 'medium cloud' → middle cloud

6. Page 11, Line 18, 'plotted Figure 6b' → plotted in Figure 6b

7. Page 16, Line 11, 'The frequency of PM10 concentrations greater' → The frequency of PM10 concentrations greater than

8. As the aerosol loading is greatly increased over East Asia since 1980s, the aerosol loading after 2000 is much larger than that in 1980s. Then, are the aerosol changes shown in Figure 10 dominated by aerosol changes after 2000? Maybe you should normalize the PM10 data for each year before compositing the multi-year mean.

9. The authors examined the time-lag correlation between PM10 concentration and the anomalous cyclone, and found that the correlation is largest if the PM10 leads by -9 to -6 days. Is it possible that this correlation is due to the 1-2-weeks period of

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synoptic systems? In other words, the northerlies associated with a synoptic system could decrease the aerosol loading, and it may appear as if the aerosol decrease is correlated with northerlies associated with the next synoptic system that comes in 1-2 weeks. In Figure 11a, the curves rise for positive lead/lag days and may reach a similar height at +10 as that at -9.

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