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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Synoptic drivers of co-occurring summertime ozone and $PM_{2.5}$ pollution in eastern China" *by* Lian Zong et al.

Anonymous Referee #2

Received and published: 4 September 2020

This paper investigated the co-occurring of ozone and PM2.5 pollution of eastern China in summer. Four synoptic weather patterns (SWPs) were detected and the air pollution feature under each SWP was analyzed. The paper is not well organized and difficult to follow. The authors should revise the manuscript carefully to meet the standard of ACP. The detailed comments are listed below.

Major comments

This paper investigated the co-occurring of ozone and PM2.5 pollution in summer. However, the probability of PM2.5, ozone and compound pollution in each site could not be found in the manuscript. Please show their distribution at beginning of the manuscript. Their distribution under each SWP should be also shown to see the impacts of different weather patterns.

In this work, four synoptic weather patterns were detected and their difference were compared. The physical understanding the SWPs could be improved. In my opinion, Type 1 and type 2 represents normal WPSH pattern during early and late summer, respectively. Type 3 and type4 reflects two splitting states (southern mode and northern mode) of the WPSH, which mainly occurs in late summer. The climate background of early and late summer is quite different from each other. Thus, the SWPs of early and late summer should be compared separately.

The abstract is not well written and following information should be included: 1) The distinct feature of each synoptic weather pattern; 2) the pollution features under each SWP; 3) which SWP mostly favors the co-occurring of ozone and PM2.5 pollution; 4) where the co-occurring of ozone and PM2.5 pollution happens.

Other comments

Line 26: Please describe details of SWPs here.

Line 30: How about the ozone pollution over the regions where are not controlled by the WPSH or the prevailing westerlies. Where are these regions?

Line 34: Please explain the meaning of "some local areas".

Line 35: Please clarify where the co-occurring surface O3 and PM2.5 pollution happens.

Line 35-36: How the WPSH affects the boundary layer height and frequency of light-wind days?

Line 36: What does the "different roles" mean? Please provide some explanations.

Line 118-120: In abstract, it is mentioned that high temperature, moderate humidity and slight precipitation favors the ozone formation. It is not consistent with the statements here.

Line 124: It is not consistent with the conclusions in abstract. In abstract, it is found

that the warm moist flow brought by the WPSH result in co-occurring surface O3 and PM2.5 pollution.

Line 148: I cannot find the position of the urban agglomeration in Figure 1a. Please check.

Line 207: Please show the temporal variations of co-occurring events.

Line 229: Please focus on the position and strength of WPSH.

Line 229: It should be the north advance of WPSH.

Line 234: Type 1 and type 2 represents normal WPSH pattern during early and late summer, respectively. Type 3 and type4 reflects splitting of the WPSH, which mainly occurs in late summer.

Line 260: Type1 mainly occurs in June and it explains why the O3 concentration is higher.

Line 295: Please show the spatial distribution of the co-occurring surface O3 and PM2.5 pollution under each SWP.

Line 300: Potential meteorological factors should be included in the results of this paper.

Line 305-310: This part should be mentioned in introduction.

Line 315-316: It is because the type 1 mainly occurs in early summer.

Line 365: Figure S6 shows probability of occurrence of compound pollution days under all four types. Please show the situation under type1.

Figures and tables:

Figure 2 and 3: Please Mark the heavy polluted cases with dark color.

Figure 4: Please draw the ridgeline of the subtropical high.

Figure 8 and Figure 11: Please compare the difference of daily mean values. An introduction of daily variations makes things difficult to follow.

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