Response: Impacts of tropical cyclone-heatwave compound events on surface ozone in eastern China: Comparison between the Yangtze River and Pearl River Deltas

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Dear Editor,

We would like to submit our revised manuscript entitled "**Impacts of tropical cyclone-heatwave compound events on surface ozone in eastern China: Comparison between the Yangtze River and Pearl River Deltas**" to *Atmospheric Chemistry and Physics.*

On behalf of my co-authors, we thank you for handling the peer review of our manuscript. We appreciate your time and efforts as well as those of the two referees for the careful reviews and constructive comments that have helped improve the quality and readability of the manuscript. We have carefully revised our manuscript to address the comments accordingly. Below are the point-to-point responses to the review comments.

Kind regards,

Key:

Black: Reviewer's comments

Blue: Author's responses

Reviewer #2:

General Comments: I read the paper "Impacts of tropical cyclone-heatwave compound events on surface ozone in eastern China: Comparison between the Yangtze River and Pearl River Deltas" by Qi et al., which discusses the effects of combined heatwave and tropical cyclone events on surface ozone levels in two river deltas in China. The topic and main goal of the study are clear, and the methodology is well implemented. However, the document requires further revision to address missing or unclear technical details and occasionally ambiguous sentences. The investigation into the potential mechanisms driving the impacts of tropical cyclones and heatwaves on surface ozone represents a novel aspect of the study.

Reply: We thank the reviewer for the constructive comments and suggestions, which are very helpful for improving the clarity and reliability of the manuscript. Please see our point-by-point responses to your comments below.

Major comments:

1) It would be useful to add a figure depicting the study area and the local observation stations to make the information clear even to those unfamiliar with the study area. Is it a flat or mountainous region?

Reply: Thanks for your constructive and helpful suggestions. We've updated the manuscript in response to your suggestions:

We have added a figure to depict the study area:

Lines 131-132: "A topographic map of the SECC including the YRD and PRD regions is shown in Figure 1."
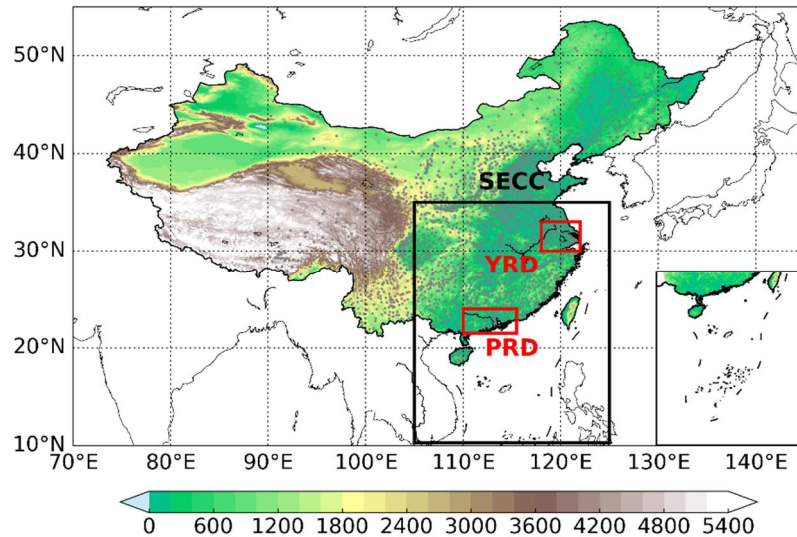
Figure 1. Topographic map of China with SECC (black box) and megacity clusters YRD and PRD outlined (red boxes). Gray points represent the temperature observation stations.

2) How did you calculate the significance of the trends, especially in Figures 1 and 5 and the corresponding text? I believe it is crucial to include this analysis in the methodology section to ensure maximum clarity.

Reply: Thanks for your constructive and helpful comments and suggestions.

We've added explanations in the method part (**Lines 171-175**): "In this work, the least squares method is applied to fit the linear trend and the Student' s t-test is used to test the significance of the trend (α =0.05). A p-value < 0.05 indicates the statistically significant trend (as shown in Figure 2). The Student's t-test is also used to evaluate the significance of the differences in ozone concentrations and meteorological variables between HD/TC-HDs and the long-term climatology.

3) Lines 708-713: The description of the figure is unclear to me. Is the climatology calculated over the period 2014-2019? If so, it would be helpful to mention this in the caption, as for Figure 3. Additionally, in part (b), it is unclear what "the proportion of high temperature sites" refers to. Furthermore, it is not clear how the mean over the area is calculated for the representation here and in Figure 4. In conclusion, the manuscript sometimes lacks exhaustive explanations of the analyses performed, and I suggest the authors review these details thoroughly.

Reply: Thanks for pointing this out.

(1) We have updated the caption of Figure 3 to cover all the above issues: "(a) The distribution of average Tmax (dots) and TC tracks during TC-HDs. (b) The Area average of Tmax anomalies during TC-HDs period relative to the summer climatology (June to August of 2014-2019), along with the TC tracks categorized by different intensities. (c) The proportion of high-temperature sites (Tmax ≥ 35°C) over land region of SECC along with the movements of the TCs. The proportion of high-temperature sites refers to the percentage of high-temperature sites within all stations in the SECC region. (d) The average of Tmax anomalies for all observational sites within SECC relative to the summer climatology, along with the movements of TCs. SECC regions are outlined in black boxes in each panel."

(2) We have also added the descriptions of Figure 3c and Figure 3d in the main text (**lines 228-231**): "Specifically, in Figures 3c&3d, the colored dots along the movements of TC tracks represents the proportion of high-temperature sites and the average temperature anomalies relative to the summertime climatology in SECC at that time, respectively."

(3) And we have added descriptions of Figure 5a and Figure 5b in **lines 261-264**: "In Figures 5a&5b, the colored dots along the TCs track represents the anomalies of regional mean MDA8 ozone concentrations for YRD and PRD at that time compared with the summertime climatology for 2014-2019."

(4) Finally, we have reviewed the manuscript carefully and made necessary corrections to improve its readability.

Minor Comments:

1. line 131-132: the sentence seems to be out of context.

Reply: Thanks. This sentence has been deleted.

2. lines 162-164: to me, the concept is not clear, could you rephrase?

Reply: Yes. We have rephrased this sentence to "Note that the anomalies of surface ozone concentrations exhibit consistent spatial patterns during HDs identified by with a lower (30%) or higher (50%) criterion for the percentage of high-temperature sites (figures not shown)."

3. Line 712-713: repetition of "movement".

Reply: Modified.

4. line 718: minis → minus.

Reply: Changed.

5. lines 256-261 and 276-281: too long sentences.

Reply: Thanks for pointing this out. We have shortened these sentences in the updated manuscript.

6. line 405: I am not a native speaker, but, is it probably better to write "concerning" instead of "compared"?

Reply: Thanks. Changed.