Re: acp-2021-618 “The impact of peripheral circulation characteristics of typhoon on sustained ozone episodes over the Pearl River Delta region, China" by Ying Li et al.”

Dear Editor,

We are grateful to the editors and the reviewers for their helpful comments and suggestions. We have revised through the manuscript following the reviewers’ comments and addressed all the critical comments. We have made significantly improvements about the manuscript, which mainly include

- The presentation of results
- English usage of the manuscript

Following is a point-by-point response to the reviewers’ comments. Texts in Blue are the reviewers’ comments, and those in normal black are our responses. All the line numbers in blue are referred to the track-change version.

We hope that you and the referees will find the changes satisfactory and we are looking forward to hearing from you soon.

Responses to Reviewer comment

Reviewer #1:

General Comment:
The authors studied the impact of typhoon on the ground level ozone over the Pearl River Delta region based on surface observations of ozone and radar observations of wind profiles. They tried to understand the processes for the observed ozone enhancement associated with weak wind deepening (WWD) in the troposphere using WRF-Chem model and the process responsible for day-to-day variability of ozone during the episode.
Following are the comments

(1) It was felt that mathematical equations can be moved to Appendix/Supplementary, so that the paper becomes more crisp.
Reply: Thank you very much. We follow this comment. The Eqs.(1)-(3) and Eq.(5) have been moved to the support information. Please check the detail in the revised manuscript at lines 262~293.

(2) Presentation of results (particularly sec 3.4) needs substantial improvement.
Reply: Thank you very much. We follow this comment. Presentation of results have been improved significantly (particularly sec 3.4). Please check the revised manuscript.

(3) Need to improve the English language by correcting the grammar mistakes throughout the manuscript, including abstract and conclusion.

Reply: Thank you very much. We have rewritten some part of the abstract and conclusion, and revise the English writting through the manuscript by re-consulting the official editing service. Please see the invoice of the service below

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(4) Minor comments are commented as notes in the PDF version of manuscript.

Reply:Thank you very much. We have reviewed the minor comments in the acp-2021-618-RC1-supplement.pdf and revised them. Please check the detail in the revised manuscript at lines 14,65,203~206,309 and 341.

Reviewer #2:

In this manuscript, the authors gave a very details study of ozone photochemistry and the meteorology (weak wind deepening, WWD) induced by the periphery of typhoon circulations by statistical analysis from 38 case observations and one case model simulations. The topic is of great interesting to recognize ozone accumulation in daily scale from each processes of physics and chemistry. The analysis is mostly sound, but the presentation need substantial improve, and some details need clarify. I recommend a minor revision and my comments listed below.

Specific comments:

（1）The presentation of the manuscript is not concise, and many sentences are not well structured. For example, in the abstract, the much long sentence from line 18- 22, is too long and not easy to grasp main points for readers.

Reply： Thank you very much for your comments. We have revised through the manuscript, especially the section 3.4, abstract, and conclusion. We also modify the English writing throughout the manuscript and re-consulting the official English editing service to improve the presentation. Please see the invoice of the service below

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（2）In abstract, IPR, ADV, HDIV etc. need define.

Reply：Thanks. We have double checked all the abbreviation and pay attention to the define it at first mention.

（3）In line 25, I suggest that “the decrease of advection outflow” replaces “the decrease of the negative ADV”, making the presentation more direct and easy to understand.

Reply：Thank you very much. We follow this comment. “the decrease of the negative ADV” have been replaced by “the decrease of advection outflow”. Please check the detail in the revised manuscript at lines 333 and 358.

(4)In line 30, I suggest delete “ By using the mass continuity equation,”.

Reply：Thank you. We follow this comment.

(5)In line 33, “typhoon could also produce significant positive ADV” seems opposite to the means of “the decrease of the negative ADV” in line 25.

Reply：Thank you very much. In the original manuscript, these two mentioned sentence does not conflict. The positive ADV contribution and decrease of the negative ADV contribution could

happened at different locations. To make the manuscript more concise, we have deleted the analysis by using the mass continuity equation. Therefore, the related results ("typhoon could also produce significant positive ADV") in the abstract have been also deleted.

(6)The legends are much different in fig.2e-h, m/s and not easy to compare.

Reply：Thank you for your comment. Figure 2a-d shows the horizontal wind field, while the figure 2e-h show the vertical wind velocity long the highlighted cross section. Here, we present the vertical velocity in Figure 2e-h to show the center of the typhoon movement and development by the strong rising air (represented by the negative values in Figure 2e-h). We do not aim to compare the horizontal wind to vertical wind, since the vertical velocity is much smaller than the horizontal wind velocity, it is hard to compare between the absolute wind speed between the vertical and horizontal direction, even though in same unit.

(7)In line 142, What is the "parcel traces"?

Reply： "parcel traces" means the path of of air parcel at vertical direction which include the dry adiabatic rise of air parcel from the ground and the path of wet adiabatic rise after reaching Lift condensation level (LCL). To make it more clear, we modify it to "parcel path" in the revised manuscript.

(8)In line 162-164, I am confused by the conclusion of "the TCs-Ozone episodes are not dependent on the enhancement of atmospheric thermal-dynamical stability and
reduction of the PBL", because just in previous sentence in line 160, you say "TC
causes descending air motions to force the aerosol particles into a very shallow layer," . The sentence in line 160 means "the enhancement of atmospheric thermal-dynamical stability and reduction of the PBL".

Reply： Thank you very much. "TC causes descending air motions to force the aerosol particles into a very shallow layer," in line 135~136 in revised manuscript is the conclusion of Wu et al(2005) in the reference and it is not the conclusion of our manuscript. The opinion of author of manuscript is different from the conclusion of Wu et al(2005). "the TCs-Ozone episodes are not dependent on the enhancement of atmospheric thermal-dynamical stability and reduction of the PBL" in lines 138~139 is the opinion of authors of manuscript based on observational results. To make it more clear, we have revised these sentence as follows in the revised manuscript.

" These results illustrate that, under the control of typhoon periphery, the PBL height can be increased in unstable atmospheric conditions, which is opposite from the observations in some TCs-haze events (Wu et al., 2005 and Feng et al., 2007). For example, the research of Wu et al.(2005) reported that the TC produces a strong descending motions in the lower troposphere, a weak surface wind speeds, and a lower PBL. Our observational results indicate that the TCs-Ozone episodes are not dependent on the enhancement of atmospheric thermal-dynamical stability and reduction of the PBL. "

(9)In line 177, On the nightàat the night

Reply：Thank you. This typo is no longer exist in this revised manuscript.

(10)Define the parameters in table 2.

Reply：Thank you very much. The parameters in table 2 have been defined. Please check the detail in table 2 in the revised manuscript.

(11)In section 3.4, the presentation is not concise and I feel it's not necessary to introduce equations 5, etc. Processes Analysis is enough to explain the sustained processes of ozone in daily variations.

Reply：Thank you very much. We follow the comment. We have moved the Eqs. (1)-(3) and (5) to the support information for the concise of presentation. Please check the detail in section 3.4 in the revised manuscript.