Dear CC#1:

Thank you very much for your comments on this work. Your feedback and suggestions are invaluable for improving our manuscript. Below, we provide a point-by-point response to your comments. The texts in blue represent the comments, while those in black are our responses. The referenced line numbers correspond to the revised manuscript with changes marked.

Specific comments:

1. The number of small figures in the manuscript is excessive. It is recommended to simplify the figures wherever possible:

(1) Figure 1a could be combined with Figure 2a. The wind field in Figure 1a should be moved to Figure 2a, while the O3 concentrations from the stations in Figure 1a could be placed in Figure 2b. In Figure 2b, the meteorological stations should be shown in black or gray. Additionally, consider swapping the positions of Figures 1 and 2.

Reply: Thank you for your comment. Based on your suggestions, we have made modifications to Figures 1 and 2. And the positions of the two figures were swapped as well. Please check the updated figures in the revised manuscript.

(2) The information in Figure 4a overlaps with that in Figures 3b and 3c. It is suggested to combine Figures 3b and 3c into one and present them as Figure 4a.

Reply: Thank you very much. The time series of ozone in Figures 3 and 4 represented different situations. Figures 3b and 3c emphasize comparisons between the observed ozone and the simulated ozone from good and bad EMs, respectively. For these figures, the ozone time series of observations was calculated by averaging the measured ozone across the stations in the GBA. Correspondingly, for the simulations (both good and bad EMs), we selected the simulated ozone from the grids nearest to the stations in the GBA and calculated the time series. The comparisons confirmed that the good EMs performed better in ozone simulation than the bad EMs did.

In Figure 4a, we aim to highlight the different variations of ozone between good EMs and bad EMs in the GBA. Therefore, the time series of ozone in Fig. 4a were calculated by averaging the ozone concentrations from all the land grids in the GBA. Through the comparisons, the differences in ozone variations between good EMs and bad EMs can be figured out clearly.

Thus, we believe it is appropriate to keep figure 3b, 3c and 4a as they are.

(3) There are too many subplots in Figure 5, which makes it difficult to interpret the figure references in the text. For example, it is unclear whether Fig. 5a1 corresponds to 10:00 LT or 11:00 LT. I recommend reducing the number of subplots.

Reply: Thank you very much. We have modified Figure 5. Firstly, the vertical profiles in Fig. 5a showed similar features at 10:00 and 11:00. We have used the profiles at 11:00 as an example to illustrate the differences in VMIX, EXCH and ozone concentrations between good and bad EMs, which are now presented as Figure 5 in the revised manuscript. Secondly, the other subfigures from the original Figure 5 have been simplified and are now presented as a new figure to explain why good EMs exhibit enhanced VMIX. The new figure is titled as “Figure 6”. Please check the updated figures in the revised manuscript.

2. In Figure 3a, it would be better to use abs(MNB) on the Y-axis, as MNB can take both positive and negative values.

Reply: Thank you for your comment. The Y-axis of Figure 3a has been changed from “MNB” to “abs(MNB)”. Please check the updated Figure 3a in the revised manuscript.

3. Line 247： “ADV is influenced wind field...” should be “The contribution of ADV is influenced by wind field …”

Reply: Thank you very much. The description has been modified. Please check the details at line 290 in the revised manuscript

4. Line 305: "The enhanced ADV of CO was also due to weak winds." This sentence may cause confusion. Strong winds accompanied by large positive/negative concentration gradients can lead to high positive/negative ADV contributions, while weak wind speeds result in lowerCO inflow or outflow. In Figure 8g, the positive ΔADV_CO could indicate that under good EMs, weaker winds have reduced the outflow of CO from the GBA region, which may be an important source of CO.

Reply: Thank you very much. We agree that discussing the change in CO contribution of ADV (ADV_CO) should consider both CO distributions and wind fields. In this study, good EMs showed enhanced ADV_CO during the daytime of July 31. We think it was primarily due to the weak winds. As shown in Fig. R1a, anthropogenic emissions of CO were high in the GBA (black square) and low in the surrounding areas. Consequently, when CO is emitted into the atmosphere, GBA is more likely to form a high-concentration zone compared to the surrounding areas. Then, with the effects of wind fields, the high-concentration zone of CO will move towards the downwind area. In this condition, wind speed is key factor affecting CO concentrations in the GBA. Comparing the good EMs (Fig. R1b) to the bad EMs (Fig. R1c), the wind speeds of good EMs were lower than those of bad EMs. The lower wind speed could lead to the high concentration of CO remaining in the GBA for a longer duration. Therefore, it could be concluded that the enhanced ADV_CO of good EMs was primarily due to the weak winds

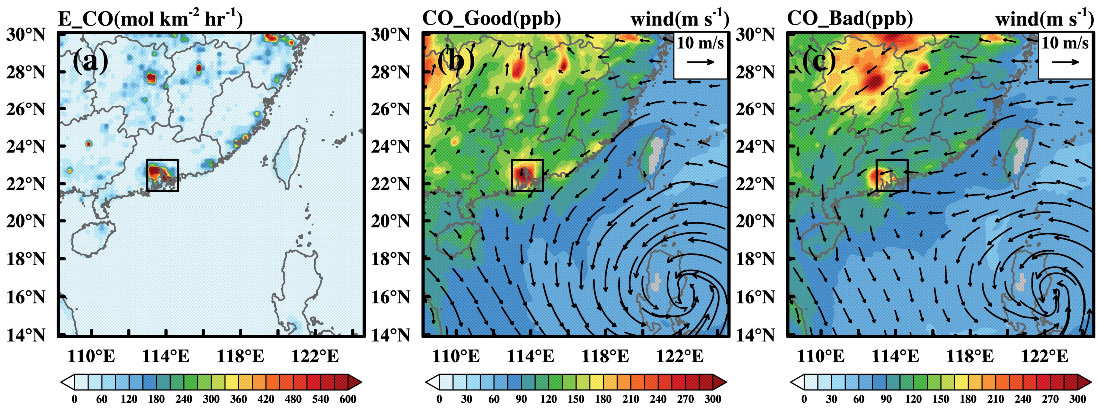

Figure R1. The mean distributions of the anthropogenic emission of CO (a) and the CO concentrations from surface to the height of 1500m during the afternoon (12:00~16:00 local time) of July 31. (b) for good EMs; (c) for bad EMs

5. Lines 338-341: "It's clear that … 14%, respectively." These sentences are unclear. Do the authors intend to convey that compared to the bad EMs, the good EMs show a significant increase in contributions from regions like GBA? Among the increased contributions, the proportions from various source regions are 73% … 14%?

Reply: Thank you very much. We apologize for this misunderstanding. What we aim to convey is that among all the source regions, the contributions from the five regions showed a significant increase. During the period from 11:00 to 16:00 LT, their respective proportions in the ozone increase account for 73%, 8%, 3%, 2%, and 14%. We have modified the relevant content, please check the details at lines 406-408 in the revised manuscript.

6. Many studies suggest that subsiding airflows in the periphery of typhoons can transport O3 from the upper troposphere or even the lower stratosphere to the surface. Did your simulations identify any similar vertical transport processes? If so, what is the contribution of this vertical transport to surface O3 levels?

Reply: Thank you very much. Previous studies have reported that the weather conditions are mostly sunny with lower wind speeds under the influence of peripheral subsiding airflows from typhoons. Such meteorological conditions can enhance the photochemical production of ozone, which is considered an important factor in the formation of high ozone episodes. In addition, as you mentioned, the subsiding airflows may also bring ozone from the upper troposphere or even the lower stratosphere down to the surface, contributing to ozone pollution. However, since the WRF-Chem model is not coupled with any stratospheric chemistry mechanisms, ozone at such altitude primarily comes from the chemical initial and boundary conditions. In this study, the two initial conditions (for domains 1 and 2, respectively) and the boundary conditions were set as independent source contributions (INIT1, INIT2, and INFLOW, respectively), but we did not further subdivide these contributions based on altitude. Therefore, ozone contribution from high altitudes (equal or higher than upper troposphere) cannot be quantified in this study. In addition, it is indeed an interesting topic. And if the WRF-Chem model can be coupled with stratospheric chemistry mechanisms, the quantitative results will be more accurate and meaningful. We think we may try this work in our future research.