Reply to Referee 1

We are grateful to the referee for the encouraging comments and careful revisions which helped to improve the quality of our paper. In the following we quoted each review question in the square brackets and added our response after each paragraph.

[1. There is no doubt that the intrusion of O3-rich air from the UTLT region is critical to occurrence of the O3 episode. However, it is not sufficient to draw the conclusion that the photochemical production of O3 is negligible if the NO2 concentration is not changed. As we know, the weather is characterized by the clear sky, strong solar radiation, weak wind, and stable atmospheric boundary layer when a typhoon is about 600 to 1000 km away. All these are the favorable conditions for photochemical production of O3.]

Reply 1: The comments are great appreciated. We agree with the reviewer and have accordingly added the following discussion at the end of second paragraph in Section 3:

"The weather over the XQR region was characterized by the clear sky, strong solar radiation, weak wind, and stable atmospheric boundary layer when TC is about 600 to 1000 km away during the O_3 episode of 12-14 June (Fig. 4). All these are the favorable conditions for photochemical production of O_3, which is confirmed by the diurnal variation of O_3 during the episode (Fig, 3d), However, a comparison of diurnal O_3 changes in June 2014 and during the O_3 episode (Fig. 3d) clearly presents the anomalies in the diurnal O_3 variation over June 12-14, suggesting a less contribution of the local photochemical O_3 production to the peak O_3. "

[2. Figure 3&4 need to be organized, time series of all the related variables during the episode should be shown in one figure (in different rows) for an easy comparison.]

Reply 2: Thank the reviewer for this suggestion. Figures 3 and 4 present the temporal variations in atmospheric tracers and meteorological conditions respectively. For an easy comparison in these the temporal variations, we have added the red rectangular columns marking the period of surface O3 event o June 12-14, 2014 over XQR in Figures 3 and 4.

[3. Figure 6. I am not quite sure about the data points in the figure, does it include both daytime data and nighttime data? If both daytime and nighttime are included, I am not sure

what the figure really means. Note that in the daytime, more primary pollutants may lead to O3 production, while in nighttime more primary pollutants (e.g., NOx) lead to O3 titration.]

Reply 3: Thank the referee for the kind suggestions. We agree the referee's opinions of different effects of primary pollutants on O_3 changes in daytime and nighttime. In our study, the correlations between O_3 and CO are used to identify the contributions of anthropogenic sources and UTLS downward transport to the tropospheric O_3 changes in the different periods. Furthermore, an O_3 episode with high nighttime O_3 was observed before typhoon landing over 12-14 June, Therefore, the correlation analysis include both daytime data and nighttime data in Fig. 6.

[4. It is better to indicate the hurricane track in Figure 2 and indicate during which period the surface O3 increased.]

Reply 4: Following the Referee's suggestion, we have added the typhoon track in Figure 2c indicating the typhoon locations during the different periods.

[5. Line 27, page 24626, change "by the downward O3 from" to "due to the downward O3 transport from"]

Reply 5: Thanks a lot. In the revised version, we modified it followed the suggestion.

[6. Line 20, page 24628, "abruptly" may not be appropriate.]

Reply 6: Thanks for the suggestion. We have revised "abruptly" to "obviously" in revised version.

[7. LN7-8, page 24629, "Tropospheric O3 is produced". this sentence is repetitive.]

Reply 7: Thanks for the suggestion. It has been corrected.

[8. LN14-15, page 24629, "Therefore" is not appropriate/robust here. Photochemical production depends not only on NOx level, but also on other meteorological factors, e.g., radiation, temperature.]

Reply 8: We delete the "Therefore" in the revised manuscript.

[9. LN19, page 24629, "As we know", why don't show it in a figure?]

Reply 9: Thanks for the suggestion. We have modified it with the following sentences: ""The weather over the XQR region was characterized by the clear sky, strong solar radiation, weak wind, and stable atmospheric boundary layer when TC is about 600 to 1000 km away during the O_3 episode of 12-14 June (Fig. 4)."

[10. LN21, page 24630, "strong downdrafts", how strong is "strong"?]

Reply 10: Thanks for the comment. In the revised version, we have added the description of "strong downdrafts" with following sentence: "The well-organized deep and strong downdrafts occurred over XQR during this episode before the typhoon landfall with the subsiding velocity exceeding 20 Pa s^{-1}at 14:00 and 20:00 in June 13."

[11. LN 28, page 24631, "the reaction of CO with OH quickly forms .", I thought the lifetime of CO is quite long.]

Reply 11: We agree with referee and delete the "quickly" in the revised manuscript.

[12. LN10, page 24632, "an exceptionally high O3". Not really that high.]

Reply 12: Thanks for the comment. The word "exceptionally" really overrates the O3 levels during this episode. We have already deleted "exceptionally" in the revised manuscript.