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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Why does surface ozone peak before a typhoon landing in southeast China?" *by* Y. C. Jiang et al.

Anonymous Referee #1

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General comments:

This manuscript presents an interesting phenomena, i.e., Hurricane related O3 episode, which might attract a wide interests. Similar O3 episodes have been noticed in North America associated with the passages of the Atlantic Hurricanes, but the mechanisms have not been discussed yet.

In this manuscript, the authors argue that the intrusion of O3-rich air from the upper troposphere and lower stratosphere (UTLT) associated with a Hurricane passage plays a critical role in the increase of surface OÂ■3 over the Southeast China coastal region. The observational analyses demonstrate no change for surface NO2Â■ and a significant increase in nocturnal O3 concentrations before the Hurricane/typhoon landing. In

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addition, the prevailing easterly winds persisted during the period of the O3 episode. The first one implies the negligible photochemical productions of O3 and the third one indicates no regional transport from polluted areas during the O3 episode. The authors conclude that the stratospheric intrusion plays a dominant role in the elevated surface O3. The finding is confirmed further by the negative correlation between O3 and CO.

In general, the manuscript is well written. The topic represents a great practical interest and the study provides a better understanding of the mechanism of the Hurricane/typhoon-related O3 episodes. The manuscript is appropriate for publication by ACP after addressing my following concerns.

Specific comments

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.

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.

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.

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

ACPD

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5. Line 27, page 24626, change “by the downward O3 from” to “due to the downward O3 transport from”

6. Line 20, page 24628, “abruptly” may not be appropriate.

7. LN7-8, page 24629, “Tropospheric O3 is produced”. this sentence is repetitive.

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.

9. LN19, page 24629, “As we know”, why don’t show it in a figure?

10. LN21, page 24630, “strong downdrafts”, how strong is “strong”?

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

12. LN10, page 24632, “an exceptionally high O3”. Not really that high.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 24623, 2015.