

## ***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 O<sub>3</sub> episode, which might attract a wide interests. Similar O<sub>3</sub> 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 O<sub>3</sub>-rich air from the upper troposphere and lower stratosphere (UTLT) associated with a Hurricane passage plays a critical role in the increase of surface O<sub>3</sub> over the Southeast China coastal region. The observational analyses demonstrate no change for surface NO<sub>2</sub> and a significant increase in nocturnal O<sub>3</sub> concentrations before the Hurricane/typhoon landing. In

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addition, the prevailing easterly winds persisted during the period of the O<sub>3</sub> episode. The first one implies the negligible photochemical productions of O<sub>3</sub> and the third one indicates no regional transport from polluted areas during the O<sub>3</sub> episode. The authors conclude that the stratospheric intrusion plays a dominant role in the elevated surface O<sub>3</sub>. The finding is confirmed further by the negative correlation between O<sub>3</sub> 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 O<sub>3</sub> 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 O<sub>3</sub>-rich air from the UTLT region is critical to occurrence of the O<sub>3</sub> episode. However, it is not sufficient to draw the conclusion that the photochemical production of O<sub>3</sub> is negligible if the NO<sub>2</sub> 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 O<sub>3</sub>.
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 O<sub>3</sub> production, while in nighttime more primary pollutants (e.g., NO<sub>x</sub>) lead to O<sub>3</sub> titration.
4. It is better to indicate the hurricane track in Figure 2 and indicate during which period the surface O<sub>3</sub> increased.

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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.

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