

Comment on acp-2022-290

Anonymous Referee #1

Referee comment on "Impact of a subtropical high and a typhoon on a severe ozone pollution episode in the Pearl River Delta, China" by Shanshan Ouyang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-290-RC1>, 2022

The manuscript entitled "Impact of a subtropical high and a typhoon on a severe ozone pollution episode in the Pearl River Delta, China" by Shanshan Ouyang et al. explored in details how the severe O₃ pollution in PRD is influenced by the weather system of subtropical high and typhoon. The manuscript provides valuable information for understanding the ozone pollution formation mechanism in coastal areas, and is well within the scope of ACP. I only have the following minor comments needed to be addressed before the publication.

General comments

One of the major findings of this manuscript is that the photochemical O₃ production is enhanced during the influence of subtropical high and typhoon, and acts a major cause of the most severe O₃ pollution in PRD. However, why the photochemistry process is enhanced during the two events is not clearly discussed. Especially, How the enhanced photochemistry related to changed meteorological factors? Although the meteorological factors and photochemical process are separately discussed, there are inner relationship between meteorological factors and photochemical process. I suggest to further elucidate how the changes in meteorological factors induced by typhoon and the subtropical high influences the photochemical production of ozone.

Specific comments

Line 114: Is the O₃ concentration corresponding to the simulated O₃ in the lowest layer (i.e., below 35 m)? If take the lowest 3 layers into account, especially for periods strongly influenced by downdraft, what would the comparison between the model simulation and the observation look like?

Line 115: Please define "NAWO" and "CNMC". Is CNMC the same as NEMC in Line 76? If so, please keep the abbreviation consistent.

Line 133: Please add description on "the second standard of air quality".

Line 137 - 138: Please define "Lev 3" and "Lev 5".

Line 173: The model overestimated WS_{10} quite a lot. Which of the wind vector (i.e., u , v , ω) has not been well reproduced that could lead to the WS_{10} overestimation? How would this overestimation further influence the evaluation of the contribution of transport / sea breeze?

Line 189: Please define U_{10} , V_{10} .

Line 210: Please define θ_v .

Line 213 - 216: Higher PBLH could result in higher O_3 concentration due to enhanced contribution of downward O_3 transport. However, higher PBLH could also favor the dilution of O_3 and its precursors, thus result in weaker O_3 production and accumulation. What would be the balance between these two effects?

Figure 5: It looks like there is a 1-hour time shift between the simulated and the observed O_3 concentration. This could be caused by the definition of the measurement time of the CNEC O_3 data (i.e., data at 1:00 represent the averages in 0:00 – 1:00). If this time shift has been taken into account, would the discrepancy between the simulation and the observation become smaller?

Figure 11b: Do the individual processes correspond to the averages of whole boundary layer?