

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2020-1286

Anonymous Referee #2

Referee comment on "A comparative study to reveal the influence of typhoons on the transport, production and accumulation of O₃ in the Pearl River Delta, China" by Kun Qu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1286-RC1>, 2021

The manuscript provides thorough analysis of the influence of typhoons on the occurrence of ozone episodes in the Pearl River Delta, China.

Despite many papers (correctly referenced by the Authors) have been published concerning ozone pollution in the area, the manuscript resumes the different aspect of ozone episodes development and can be a guide through previous literature. The modelling section is, from my point of view, the most important to provide a clear support to the hypothesis and correlations provided by the previous analysis. A possible missing point is the evaluation of the overall import/export of ozone, to estimate if the PRD region is responsible of a net export of ozone increasing the amount of pollutant over the region.

The overall result that typhoon influenced O₃ episodes have a major contribution from long range transport (from outside the model domain) and advection from nearby China regions has relevant policy implications that are only quickly commented in the conclusions and would merit a wider discussion. Local O₃ precursor emission control can be expected to have a limited effectiveness and regional policies seem definitely needed, at China national level but even at South and East Asia regional level, to be able to reduce population exposure and overall ozone production.

The manuscript is well written and needs few clarifications/integrations to reach publication quality.

Detailed comments

Introduction

Lines 40-42

This is due to the O₃ persistence in the atmosphere due to its relatively long lifetime in the atmosphere. The Authors should consider mentioning it.

Line 49

“of” just before the symbol “>” should be removed.

2 Methods

Lines 104-105

Why precipitation is not considered?

Lines 122-123

Does the mentioned “30%” refers to the total number of days or to the number of polluted days?

Lines 123-125

This consideration seems convincing for July only. For October the difference of values with/without typhoons seems rather small.

Lines 129-130

This is not clear, what is the reason to discard 5 episodes?

Line 157

Why the endpoint of the back trajectories has been set to 500m and not nearer the surface?

Lines 161

What is the horizontal space resolution of the mentioned matrix?

Lines 163

Setting the trajectory starting points to 100m seems reasonable for industrial emissions, but it seems high for road transport related emissions or other surface sources.

Lines 165-167

Were time durations attributed to points and then gridded? on which target grid?

Line 168

The sentence "model, the CMAQ model (version 5.0.2)" should be simplified to avoid useless word repetition.

Line 173

The meaning of the sentence "all O3 pollution days in these two months served as representative O3 pollution days under multiple scenarios." is not clear.

Lines 176-178

The meaning of this sentence is not clear.

Line 180

"CMAQ model", or "model application" would read better than "CMAQ modelling".

Lines 210-214

Alternatively to zero emission a fractional reduction could be applied to reduce non linearity. See e.g. <https://fairmode.jrc.ec.europa.eu/activity/ct1>

The Authors should comment this alternative approach and the reasons supporting their choice.

3 Comparison of meteorological conditions

Lines 227-231

It is not clear how ERA-Interim fields have been processed. Has a gridded area been processed or timeseries have been extracted in few points? What choice has been done and why?

Lines 228-229

The reference to first and second categories in Sect 2.1 is not clear.

Lines 269-271

This sentence is not clear. Does it mean that during the summer the air masses advected by slow wind are expected to bring higher O₃ concentration? Or with low wind speed local phenomena would prevail on advection?

Lines 279-280

The reference to Sect 2.1 is not clear.

Lines 280-281

Are values in Figure 4 mean values over the considered time period?

Line 282

Downdrafts seem to be at higher levels from the Figure. Please refer to the Figure vertical scale in hPa to be better understood by the reader.

Line 314

How values in Figure 6 have been computed from ERA-Interim fields? Are they mean values?

Line 343-344

The meaning of the sentence is obscure, what does "and offset the influence of weakened O₃ formation to some extent." mean?

Lines 344-346

Please relate to the unfavourable/favourable conditions for ozone formation shown in the previous sections.

4 Comparisons of O₃ processes and sources

Lines 427-428

I can't find this number in Figure 10.

Lines 482-483

This discussion about anthropogenic emissions control is relevant and should be expanded to provide useful input to air quality management and suggestions to conceive measures capable to reduce the population exposure and the production of ozone at global scale.