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Comment on acp-2021-849

Anonymous Referee #1

Referee comment on "North China Plain as a hot spot of ozone pollution exacerbated by extreme high temperatures" by Pinya Wang et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-849-RC1, 2021

This study investigates the co-occurrences of extremes in surface O_3 and extreme heat based on observation datasets, GEOS-Chem model simulations and latest CMIP6 outputs. Detailed analysis on historical and future projections of the coupled extremes as well as the health impact is discussed. The results represent the advances in understanding the interactions between extreme weather events and air pollution. In general, I find the manuscript well written and I recommend it for publication after addressing the following comments:

Major comment:

1. The section of model evaluation: I feel the discussions can be more elaborated (Supporting information), and a bit more detailed information such as mean bias, or fractional bias, etc., is useful to indicate more confidence in interpreting the simulated results.

2. In terms of the emissions: the authors only discussed anthropogenic emission inventory. How about biogenic emissions? Considering that biogenic emissions are quite important for ozone formation, particularly of the synergic effect of biogenic and anthropogenic emissions on ozone formation, it is useful to indicate how the biogenic emissions were treated in this study.

3. About the impact of extreme events on ozone: the compound extreme events have recently been raised as a substantial concern to ozone formation. At least adding a few sentences or references to discuss the compound extremes (i.e., multiple extremes occur simultaneously) and the associated impact on ozone formation is useful.

Minor comments

- Lines 80, 187, change "O3" to "O_3" and check throughout the entire text.
- Line 208, change "MDA O_3" to "MDA8 O_3".
- Missing subtitle (b) in figure 2.
- Line 264, please be careful that the enhanced chemical production and weakened mixing and dry deposition contribute to the increase O_3 level during OPCs.
- Please use a larger font size in Figure 4 as the subtitle in each panel is hard to read. The same applies for Figure 5.
- In terms of the health impacts of OPCs, have you considered the possible impacts of temperatures on surface ozone related health risk, i.e., higher temperatures may worsen the health impacts of surface ozone.
- Line 212. Repeated definitions of abbreviation. An abbreviation is only needed with it appears for the first time. Please double check the entire texts.
- As the author stated that GEOS-Chem simulations cover only the period of2014-2017, does this mean that the definitions of OPCs and OPIs are applied to 2014-2017 for both observation and simulations? How about future?
- The caption of Figure S3: downward solar radiation flux

Does this mean downward surface solar radiation?

- Figure S8 includes some important information, and it is good to move it to the main manuscript.