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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impacts of compound extreme weather events on ozone in the present and future" *by* Junxi Zhang et al.

Anonymous Referee #1

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The authors conducted a study to investigate the impacts of two types of extreme weather events on the U.S. ozone air quality in the future climate. To achieve this goal, they have made use of a chemistry model and an ensemble of CMIP5 models. They found the compound events have larger effects on the ozone concentrations and these events would become more frequent by 2050s. Overall, I think the topic is suitable for ACP. But the authors should improve the presentation quality and address the questions raised by the two reviewers before the paper can be accepted.

Major Comments

1. The presentation quality of this manuscript needs to be improved. The authors made a lot of descriptive statements without a reference. I have tried to list some of them but the authors should go through the manuscript and check every sentence. Many figures

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Discussion paper

are too compact. Please enlarge the font size and use subtitles to more clearly convey the main information of each plot. In the caption, briefly mention the data and model that you use. Otherwise, readers who just browse the paper will get lost.

2. The authors should show more details about the capability of WRF-Chem in simulating the ozone variability under the extreme weather. These figures should be shown. Or maybe the authors have shown some of these figures in the supplement, but I don't read clearly since they seldom mention the data or the model used for each figure in the caption. a). A map of ozone distribution w/o the influence of extreme weather events for both observations and model simulations. b). Show if WRF-Chem can simulate the interannual variability of high ozone. If the R2 is too low, maybe using WRF-Chem is not a good strategy. c). Show a map of the fraction of ozone episodes that are driven by heatwave and stagnation in observations and the model simulations. If this fraction is too low, how will this affect the final conclusion of this study?

3. As I read from the paper, the future meteorology used by WRF-Chem is downscaled from one single climate model. How will the meteorological changes from this single model be compared to these from the ensemble of CMIP5 models?

Minor Comments

Line 41. 'in US' should be 'in the US' Line 42. 'RCP 8.5' should be 'the RCP 8.5' Line 53-54. 'high ozone episodes are not eliminated'. You should define 'high ozone episodes' Line 76-77. Missing reference. Line 78. 'govern ozone and its changes'? Not clear. Line 80. Should be 'the presence of high precursor emissions'. Line 178-179. Need a reference for the definition of climate regions. Line 241-242. Need a reference. Line 242-24. Need a reference. Line 248-249. Need a reference. Line 282-283. The R shown in Figure 3 is only 0.3-0.4. Why this leads to the conclusion that WRF/Chem reasonably reproduced the observed ozone extremes? Line 318-321. The authors use too many quantitative words here, such as 'well captured' and 'considerable skill'. I am not very convinced that WRF/Chem can well simulate the ozone extremes in the US

without further evidence. Line 396-398. Is this supported by a reference? Line 416-418. Is this simulated by a chemistry model? Figure 1. Use subtitles that can more clearly convey the main information. For example, “(a) NARR” can be changed to ‘(a) NARR, heatwave’. Figure 3. Switch the x and y axis.

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