Comment on acp-2021-554

Anonymous Referee #2

General comments:

This is a manuscript delivering important messages towards China's air quality policymaking. They found that crop yield damages due to ozone air pollution have increased in recent years and are especially large for wheat and rice. Accumulatively, the economic losses are substantial, i.e. around ~20 billion USD for major crops during the past 8 years. Findings of this study indicate that improving China's ozone air quality can benefit food security, in addition to human health which has been the dominant driver of previous clean air policies. This reviewer works broadly in the arena of atmospheric chemistry and policy-relevant science instead of being an expert on vegetation impacts of ozone, thus will only judge based on best expertise. This reviewer recommends the acceptance of this manuscript if the following comments can be sufficiently addressed.

Specific comments:

Introduction:

- In the first paragraph, it is worth adding the mechanisms of observed increasing ozone concentrations in China. The reasons include not only increasing anthropogenic VOC emissions but also decreased ozone titration due to decreased NOx emissions especially in megacities where ozone production is usually NOx-saturated. It is worth reviewing relevant literature.
- Line 48-54. Literature seems to find very large yield decrease effects for soybean

compared to other crops. I wonder why the authors found relatively small impact as indicated by Line 22, which is one order of magnitude smaller than previous research.

- L57-60: statement of the key innovation of this study does seem as persuasive, since Line 54-57 indicates that a recent study evaluates effects of ozone on yields of 3 crops for 4 years. The authors do 4 more years of analyses with 1 additional crop (i.e. soybean). Are there new data used or improved model simulation or emission inventories adopted in this research? This novelty statement seems a bit weak. In addition, did previous research not at all examine spatial variations of ozone damages to crop yields? If there are any, they need to be included as literature review here.

- It is probably also useful to mention the uncertain impacts of climate change on crop yields and increasing future food demand associated with increased population and increased meat demand thus animal feed crops, in the introduction or somewhere in discussion. This will make the evaluation of ozone yield effects and potential mitigation appear to be more urgently relevant to air quality and food security.

Methods:

- Line 83: Model's underestimation of AOT40 seems a bit severe. Is there a way to constrain model results with observations? Does the under-estimation indicate underestimate of ozone concentrations? If this is a modeling issue pointed out before, relevant literature needs to be described? Possible mechanisms need to be addressed in Discussion.

Results:

- 1 title 'ozone concentration change' is not precise – it is metric (AOT) value change. Consider revising the title.
- Line 141-144 seems to address my previous comment on Introduction but this review of literature has been put in a weird place.
- Line 145-146: To explain the peak of AOT40 in one specific year, one needs to figure out whether the seasonality of ozone concentrations have changed over time since the growing season likely remain the same across years, correct?
- Section 3.2 and 3.3 list many detailed results. I wonder if at the beginning of each paragraph the authors can summarize the findings in one topical sentence. What are the findings that should be noted without getting into all the details? The readers may get very lost with all the details.
- Line 217-218: results of this research is much much smaller than this previous research.

Discussion:

- It appears to me that Line 250-279 are still about results, although some comparisons with earlier research has been added.
- Line 280-end appears to be actually like a real 'Discussion' that really expands the findings of the research. There are not very clear messages to policymaking regarding ozone control in which provinces should be prioritized. Consider improving the Discussion. More details could be provided regarding how to address ozone pollution in prioritized regions (i.e. high losses).

Grammar issues need to be fixed, to name a few, line 20 'in 2017'; Line 73 'outside of China' instead of 'outside China'

Tables and Figures:

Table 1 seems to be methods and from previous research, instead of actual research design or results.

Figure 3 consider putting the names of corresponding crops next to the (a) (b) (c) (d)…

Figure 4 For some crops, the losses peak at 2014 while for others the losses peak at 2015.

Figure 5 the caption needs to describe panels a) and b). Do you simply group the provinces based on the magnitude of values?