Atmospheric
Chemistry
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Discussions

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Interactive comment on "Future changes in Beijing haze events under different anthropogenic aerosol emission scenarios" by Lixia Zhang et al.

Anonymous Referee #1

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This paper investigated how future changes in anthropogenic aerosol emissions, determined by projected future scenarios, would impact on the frequency and intensity of haze events in Beijing. The results show that in the scenario of stringent aerosol emission reductions, the frequency of the mechanisms conducive to such haze events increases but the severity of the resulting haze events decreases. The meaningful results are obtained using model simulations of two future scenarios (current legislation emissions and maximum technically feasible aerosol reductions) from two fully coupled climate models, compared against a historical simulation. The methodology and analysis is clear, the results are comprehensive and the resulting conclusions are of real value. Although generally well written, there are numerous grammatical errors that make the manuscript, particularly in the results section, harder to understand. It

would benefit from another thorough re-read to address these errors. Some of the errors/typos are highlighted in the technical comments, but not where rewording is required. After this is addressed, along with the following comments, I would recommend accepting this paper by Atmospheric Chemistry and Physics.

1) It is not clear in the explanation for how a haze event has been defined (based upon a HWI-month threshold of 1), why a higher value was not chosen initially. For example, selecting the threshold at HWI-month $\geq$ 2 would incorporate a greater percentage of days with HWI-daily $>$ 0. A brief explanation of why a value greater than 1.0 was not chosen would be helpful. This would also help the reader understand the results paragraph pertaining to Figure S7.

2) The description of the results shown in Figures 12 is delivered in a rather confusing way, and not consistently between the main body and the figure caption. A more thorough description on what is being shown is needed.

Technical comments:

The following references are cited, but not in the reference list - please include if these are the correct references (please also check the rest of the reference list is accurate with the manuscript):

Liu, C., Zhang, F., Miao, L., Lei, Y. & Yang, Q. Future haze events in Beijing, China: When climate warms by 1.5 and 2.0°C. Int. J. Climatol. 40, 3689–3700 (2019).

Liu, Z. et al. A Model Investigation of AerosolâĂŘInduced Changes in the East Asian Winter Monsoon. Geophys. Res. Lett. 46, 10186–10195 (2019).

In some of the figures the location of Beijing is marked by a green dot. I recommend having this green dot displayed on all the figures where Beijing is shown.

Figures 5-7 – It would be useful to define within the captions the extent of the boxes (Fig 6 and 7) and lines (Fig 5)

Figure 9 – hard to visually judge the amount of change between His, CLE and MTFR – this could do with a statistical value to complement the histograms to aid interpretation. Please add.

L58 - Citation needed

L84 – An et al., 2019 – change from 2015

L92 – Citation needed

L142 – Please clarify whether the year 2015 is correct. Table S1 states HadGEM3-GC2 historical run goes to 2014.

L160 – include "(not shown)" after India for clarity – as India isn't shown in Fig. S1a.

L161 – same as comment L160

L210 – typo – should this be HWI greater than 0.0?

L215 – Missing words

L244 – Change 500hPa to 850hPa

Figure S4 – Denote what the green boxes show in the caption

L256 – The mean for the historical period (His) is quoted over the years (1980-2014), however every other instance the baseline/His period is stated to be 1980-2004, e.g L156. Additionally, in Figure 3a, the grey data runs to 2014, not 2004. This is confusing and needs to be clarified.

L275 – For consistency should be 3 significant figures, like L273, so change to 7.1% and 7.3%.

L277 – What does 'increase in atmospheric circulation patterns' mean? Please clarify

L288 – What are the mean values? Could these be included somewhere on Figure 4?

L309-310 – Sentence doesn't make sense. It refers to the difference between the 2

experiments (MTFR – CLE, not CLE – His) but this isn't stated. Also Fig.S5 c,d refer to 850hPa. Please clarify.

L326 – should be 'MTFR v His' rather than 'MTFR vs CLE' as the anomalies over the North Pacific show less of a change between the two plots 6a and b. Please clarify.

L342 – typo

L364-365 – Siberia is SLP1 – please clarify.

L390 – Change to Fig.11a-b

L393 – Include reference to Fig.11b-d

L665 – replace (a) with (b)

L715 – (c)-(d) needs amending to (b)-(d)

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-957, 2020.