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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Anthropogenic Fine Particulate Matter Pollution Will Be Exacerbated in Eastern China Due to 21st-Century GHG Warming" *by* Huopo Chen et al.

Anonymous Referee #1

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Chen et al. attempted to elucidate how PM pollution in eastern China will response to future GHG warming, using a large ensemble of CESM simulations. The authors reported that GHG-induced climate change will increase PM pollution days, especially the most severe polluted days (PM2.5>75 μg m-3), at the end of 21th century and they argued that reduced tropospheric winds and light precipitation days can be the reasons. Their results are interesting and could deepen our understanding of the impacts of climate change on air quality. The topic is suitable for ACP readers, and this paper is well structured. However, I have some concerns about the linkage between pollution increase and changes in meteorology. The authors need to address the following comments before it can be published.

General Comments:

- The authors found an increase of 68% in the most severe pollution days, with only an increase of 3% for light pollution days, but they attributed such increase to the mean change of future GHG-induced climate change. In statistics, I think the increase in most severe pollution days represents the extreme cases, whose linkage to mean climate change needs to be further explored, or at least discussed.

- The ACCMIP (Lamarque et al., 2013) also archives similar simulations by several climate models. It would be helpful if the authors can compare their results with ACCMIP models. Just a suggestion.

Specific Comments:

-Line 32-34: As indicated above, the authors should take care here.

-Line 134-140: The relationship between air stagnation index used here and PM2.5 pollution in China may be not well correlated (e.g., Feng et al., 2018).

-Line 148 and Figure 1: Why chose a reference concentration of 75 μg m-3. The annual PM2.5 standard in China is 35 μg m-3.

-Line 170-172: The correlation is based on what observational and model data. Should make it clear.

-Line 173-175: Same as above, the low bias in model depends on what observational PM2.5 you used. As reported in Li et al. (2016), the RCP emissions for year 2005 underestimated anthropogenic emissions of aerosol precursors over China. Thus, the lower PM2.5 concentration in model could also partly attribute to underestimated emissions.

-Line 182-183: Which region you average the PM2.5 concentration for "eastern China"?

-Line 205: What "SC" shorts for?

Reference:

Lamarque et al., (2013). The Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP): overview and description of models, simulations and climate diagnostics. GMD. 6(1), 179-206.

Feng et al., (2018). An air stagnation index to qualify extreme haze events in northern China. JAS.

Li et al., (2016). Implications of RCP emissions on future PM2.5 air quality and direct radiative forcing over China. JGR. 121(21).

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