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Comment on acp-2021-198

Anonymous Referee #1

Referee comment on "Competing effects of aerosol reductions and circulation changes for future improvements in Beijing haze" by Liang Guo et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-198-RC1, 2021

Review of "Aerosol reductions outweigh circulation changes for future improvements in Beijing haze" by Guo et al.

The authors quantified the role of aerosol emissions and climate in future Beijing haze changes under the SSP scenarios using the latest multi-model simulations (CMIP6) and air pollution indices. They find that haze weather patterns are projected to increase under all the SSPs, which is driven mainly by GHG emission increase. However, local aerosol emissions reduction would be the dominant contributor if PM2.5-related metrics are applied. They highlight the important role of aerosol reductions in future pollution control. This study fits the scope of ACP well and provides some interesting results. Overall, the methods are reasonable and conclusions are supported by clear illustrations. However, I have the following concerns and hope the authors can resolve them before publication.

-The title is sort of confusing. Do circulation changes have to improve Beijing haze in the future?

-The scientific aim of this study should be further clarified. The authors highlight aerosol reductions outweigh circulation changes for future Beijing haze changes. However, this is not surprising at all. It is commonly known that aerosol emission changes dominate the long-term haze changes, and meteorological indices can't be used to project the real change in air pollution (L175-177).

-The authors didn't say anything about nitrate and ammonia aerosols in this study. These two aerosols are increasingly important with the control of SO2 and primary PM2.5. I think some of the CMIP6 models include these two species. A discussion on this issue should be added, at least.

-L15-16: Any reference for the emission changes?

-L24: “emission reductions of up to 90%” refers to all aerosol emissions? I think only transportation sector declined so much.

-It is confusing about the title of Section 2.3: Data. You also introduced data information in Section 2.1.

-L168: what does “these patterns” mean?

-Fig.1: Why only SO2 and BC emissions?