

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2022-558-RC1>, 2022
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Comment on acp-2022-558

Anonymous Referee #1

Referee comment on "Hemispheric-wide climate response to regional COVID-19-related aerosol emission reductions: the prominent role of atmospheric circulation adjustments" by Nora L. S. Fahrenbach and Massimo A. Bollasina, Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-558-RC1>, 2022

Review of the manuscript entitled "Hemispheric-wide climate response to regional COVID-19-related aerosol emission reductions: the prominent role of atmospheric circulation adjustments" by Nora L. S. Fahrenbach and Massimo A. Bollasina

General comments

Using Earth System Models participating in the Covid Model Intercomparison Project (CovidMIP), this manuscript showed that a marked decrease in aerosol emissions over eastern China results in a lower aerosol burden, which leads to an increase in surface downwelling radiation and ensuing surface warming, in turn affect the global/regional climate including ocean responses. Their results are very important and useful for understanding the multifaceted and multiscale climate response (especially superfast response) of COVID-19-induced aerosol emission changes, especially the rapidly evolving emissions over the eastern China and India. Several points of the manuscript still need to be improved before accepted. Therefore, I recommend accept the manuscript with minor revisions. Please see the following comments.

Specific comments

(1), The authors can cite the newest PDRMIP data paper in the description of PDRMIP (Myhre et al., 2022).

Myhre, G., Samset, B., Forster, P.M. et al. Scientific data from precipitation driver response model intercomparison project. *Sci Data* 9, 123 (2022). <https://doi.org/10.1038/s41597-022-01194-9>.

(2), In line 86, the authors may cite the following new paper (Xie et al., 2020), which also obviously show the changes of the large-scale atmospheric circulations and surface precipitation associated with Asian summer monsoon induced by sulfate and black carbon aerosols using the PDRMIP data.

Xie, X., Myhre, G., Liu, X., Li, X., Shi, Z., Wang, H., Kirkevåg, A., Lamarque, J.-F., Shindell, D., Takemura, T., and Liu, Y., 2020: Distinct responses of Asian summer monsoon to black carbon aerosols and greenhouse gases, *Atmospheric Chemistry and Physics*, 20, 11823–11839, <https://doi.org/10.5194/acp-20-11823-2020>.

(3), In line 91, Previous studies (e.g., Liu et al., 2018; ?; Persad and Caldeira, 2018), which reference the symbol "?" represents? Please add the corresponding reference.

(4), In the Figure 1 caption, the eastern China and India with regions defined in (a)-(d). The authors maybe add the detailed longitude and latitude information (such as ?-?N, ?-?E) for the defined eastern China and India to provide readers with reference, respectively.