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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Uncertainty in Aerosol Radiative Forcing Impacts the Simulated Global Monsoon in the 20th Century" *by* Jonathan K. P. Shonk et al.

Anonymous Referee #1

Received and published: 31 August 2020

The authors present a high-level analysis of the temperature and precipitation response in monsoon regions to a wide range of aerosol emissions, scaled from the historical CMIP6 dataset. The paper is well written and the figures are clear and of high quality. The topic is squarely within the scope of the journal. However, the paper is very short, and the discussion and analysis are quite shallow. If the authors can add a little more depth to their analysis, I can recommend this for publication.

Further comments:

1. The abstract is really brief. There needs to be some detail there. The name of the model isn't even mentioned in the abstract. It appears the whole article is written more

in "Letter" format.

2. Page 1 Line 24: Not all aerosols cause negative radiative forcing

3. Page 2, Line 7-8: See also and consider citing Westervelt et al. (2018) Westervelt, D.M., A.J. Conley, A.M. Fiore, J.-F. Lamarque, D.T. Shindell, M. Previdi, N.R. Mascioli, G. Faluvegi, G. Correa, and L.W. Horowitz, 2018: Connecting regional aerosol emissions reductions to local and remote precipitation responses. Atmos. Chem. Phys., 18, 12461-12475.

4. Page 2, Line 11: Regarding AA emissions look likely to decrease. This is probably true, but nonetheless it is dependent on projections/IAMs and at the very least a citation is needed here (i.e. one of the RCP or SSP papers)

5. Page 2, Line 24: I don't believe this is the first time someone has investigated climate response to a variety of forcing levels (or emissions). Perhaps you mean the first time in this particular model.

6. Section 2. Monsoon regions (especially in Africa) may be strongly impacted by natural aerosols (dust mostly). The reader needs to know what the model is doing for dust.

7. Section 3 and Figure 2. Why not present GMST as an anomaly as in commonly done? This will make the results more comparable to the many other studies looking at temperature response to aerosols, since models may have different baseline temperatures.

8. Page 5 Line 20. "...climate responses vary monotonically and roughly linearly across the 0.2 - 1.5 scalings." I find this to be pretty interesting given the complexity and nonlinearity of the aerosol-climate system. This also may be one of the more novel findings and one that SMURPHS is uniquely positioned to answer. Perhaps this could be a sentence added to the abstract.

Page 8, line 8, final paragraph. Sorry but I don't see the point of just parachuting

in a bunch of appendix figures/tables for the other regions. Referring specifically to Figures A2, A3, and Tables A1 and A2. Any figure in the paper should be discussed and contribute to the narrative, or else it shouldn't be included. It seems that there is a wealth of interesting analysis that could be written about these two tables and two paragraphs.

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