Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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# Comment on gmd-2022-10

William Collins (Referee)

Referee comment on "Further improvement and evaluation of nudging in the E3SM Atmosphere Model version 1 (EAMv1): simulations of the mean climate, weather events, and anthropogenic aerosol effects" by Shixuan Zhang et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-10-RC2, 2022

This was a clear study that successfully explained some biases in the previous nudging schemes. The comments on time resolution will be useful to the community which generally used 6-hourly data.

For the aerosol forcing why is 6-hour nudging used when the authors have shown that 3-hour is preferred? This experiment should be repeated with the 3-hour resolution. The authors could explain the issues with the temperature nudging more fully. The effects are attributed to biases. While this could be true for ERA, this should be much less significant for CLIM (fig 2(e)) and would be even less so for 3-hourly (in fig 4(d)). Is this actually removing a meteorological adjustment to the aerosols?

Specific points:

Figure 1: Why is the nudging tendency applied at a different place in the sequence to where it is calculated?

Line 154: Please define how CF is calculated.

Figure 3: This is a useful figure that nicely explains the effects.

Line 345: The differences in emissions between 1850 and present should be detailed here or in the supplement.

364: It is not obvious why there should be biases when nudging to CLIM. However if EAMv1 has notable biases then it is not clear why improving the temperatures by nudging to ERA5 doesn’t give a more physical measure of the aerosol forcing than using the biased temperatures.