

Geosci. Model Dev. Discuss., referee comment RC1
<https://doi.org/10.5194/gmd-2022-10-RC1>, 2022
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Comment on gmd-2022-10

Anonymous Referee #1

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-RC1>, 2022

Zhang et al. (2022) improved the EAMv1 by revising the sequence of nudging tendency in the model and increasing the nudging frequency. The manuscript has thoroughly discussed the nudging impacts from several sets of model simulations and provided suggestions for the nudged simulations. The manuscript is well organized and has addressed key issues in the nudged model simulations in EAMv1. Below are a few comments.

General comment

The EAMv1 nudging simulations are improved in this work. My major concern is the model resolution used in this work. The current model is configured to be 1 deg. It does not fully take advantage of reanalysis data with higher spatial resolution, which may dilute the impacts from ERAI and ERA5. On the other hand, if the model is configured to a higher spatial resolution (which is the direction in the global climate community), the model accuracy to simulation important small-scale processes could also be improved. In that case, it may require a different nudging strength or frequency.

Specific comments:

Page 9, Figure 3, typo? No magenta box in Figure 4e. Maybe Figure 2e?

Page 21, line 350-351, there is no Table S3 in the Supplement. Also, I'm confused about the sign between line 351 and in Figure 12. Suggest to clarify the discussion here.

Page 21, line 365-369, this is also a typical approach in many other earth system models.