Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
https://doi.org/10.5194/gmd-2022-35-RC1, 2022

Comment on gmd-2022-35

Anonymous Referee #1

Referee comment on "Checkerboard patterns in E3SMv2 and E3SM-MMFv2" by Walter Hannah et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-35-RC1, 2022

Review Comments For GMD-2022-35: Checkerboard Patterns in E3SMv2 and E3SM-MMFv2

This work identifies checkerboard patterns in the E3SMv2 and E3SM-MMF simulations. The pattern is mostly prominent in the precipitation and liquid water path and shows persistence in various timescales. The authors identified the DCAPE convection trigger as the primary cause of such a pattern in E2SMv2 by showing a diminished pattern when turning off the trigger. They also provided an hypothesis that the pattern in E3SM-MMF is caused by the fluctuation trapping. Satellite data are used as a validation reference. Potential solutions for both model configurations are discussed at the end.

This paper is well written. It brings up the non-negligible persistent and non-physical patterns in the model results, and logically tracks down the causes for the patterns. It points out the potential problems with the physical parameterization (i.e., convection trigger) and the design of CRM configurations of E3SMv2. I recommend acceptance with minor revision.

A general question for curiocity: Have you performed any sensitivity tests on various resolution setups? It would be interesting to see whether the patterns occurs at all or whether they are more/less frequent under different resolutions.

Minor comments:

- Lines 182 - 186 and Figs 4-5: As the authors pointed out, the E3SMv2 shows less obvious patterns. It will be better to show 1) a map of difference between with/without

DCAPE, and 2) maps of the differences between simulations and satellite regrided results.

- Line 196: I believe the author meant to refer to Figure 6b,d here.
- Figure 6: Is there an explanation why the simulation without DCAPE is even smoother than satellite results?