



EGUsphere, referee comment RC2
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Comment on egusphere-2022-397

Anonymous Referee #2

Referee comment on "A method for transporting cloud-resolving model variance in a multiscale modeling framework" by Walter Hannah and Kyle Pressel, EGU sphere, <https://doi.org/10.5194/egusphere-2022-397-RC2>, 2022

Review of "Transporting CRM variance in a Multiscale Modeling Framework" by Hannah and Pressel, submitted to GMD.

This manuscript reports development of a technique that helps removal of what the authors refer to the "checkboard pattern". Overall, I find the paper suitable for GMD. I have two general comments and several specific points that should lead to an improved presentation. The paper can be published after some revisions and clarifications in response to my general and specific comments below. I do not need to see the revised manuscript.

My first general comment concerns the stand-alone aspect of the submission. The presentation follows already published manuscripts concerning E3SM-MMF and reports developments motivated by those publications, up to the point of repeating some of the figures. I feel the authors assume that readers are familiar with the past work, and thus they use terms and concepts that are unclear unless you are familiar with those past manuscripts. Since I was not familiar, I had to go back to those previous manuscripts. I feel this needs to change to make the paper more stand-alone. I have several specific questions and suggestions below that should improve that aspect of the manuscript.

- Section 2.2. I think it would help if the technique is illustrated by a figure. If I understand the approach, you simply “scale up” the variance in each CRM based on GCM advection from the neighboring columns, correct? The key is that alpha is advected by the GCM, correct? If the CRM field (at a given height?) is q , you make it alpha q , correct? Can this be shown in a figure? Also, alpha is height-dependent, correct? It would help to state this clearly.

- What is F in (11)?

- Section 3.1. I feel a figure describing the detection would help. This is not clear unless one goes back to Hannah et al (2022). A figure or two from that paper would help.

- Section 4.1. Several statements in this section are hardly evident in the figures. Line 234: perhaps a hint of a double ITCZ? L. 235: I do not see the checkboard pattern. My suggestion is to improve the figure, maybe with a small insert, so the features mentioned are better documented. I think Fig 2 does show that pattern, correct?

- Section 4.2. How is “fractional occurrence” defined? It is unclear to me what Fig. 3 shows. How the “extremum in the local neighborhood” is defined (in IMERG and in the model results)? Figure 4 shows clear differences, but if I do not know what the fractional occurrence is how can I gauge the significance of those differences? Fig. 5 provides a clear impact of the improvement and good comparison with observations. I do not understand what Fig. 6 shows, please explain.

- Please clearly define what each panel of Fig. 7 is showing. Also, do the numbers shown have some relevance to the real world? For instance, the maximum temperature variance (temperature or potential temperature?) is around 0.6 K^2 . Does this mean that the CRM variance is less than 1 K? How this compares to either observations or cloud-scale simulations of tropical convection? Can you explain why GCM and CRM transport panels seem to have the same pattern but the opposite sign? What is the reason for that? Some physical interpretation would be good. This is briefly discussed, but I would like to see more physical interpretation. Similar comments apply to Fig. 8 (please define all panels in the figure caption).