Comment on gmd-2022-114

Anonymous Referee #1

Referee comment on "Climate impacts of parameterizing subgrid variation and partitioning of land surface heat fluxes to the atmosphere with the NCAR CESM1.2" by Ming Yin et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-114-RC1, 2022

Yin et al. (2022) builds on work presented in *Sun et al.* (2021), which introduced a new parameterization to capture the impacts of subgrid surface fluxes by randomly sampling from distributions of sensible and latent heat fluxes within a gridcell and using those samples to drive unique realizations of the PBL and convection schemes in CESM1.2. *Yin et al.* expand on that to include a condition that the sensible and latent heat fluxes being sampled are either positively or negatively correlated with one another to better capture their relationship and land-atmosphere interactions. The method is novel and holds promise for inclusion in GCMs, though I believe major revisions are needed before this work is published. My main concern is that while model improvements stemming from EXP_COR are strongly emphasized, regions where performance has been degraded are rarely discussed. It is not yet clear that this version of the parameterization represents a strong improvement over the original EXP run. The discussion around each of the figures requires major revision as a result. It would also be beneficial to highlight the model performance globally with more detail. Specific comments can be found in the attached PDF.

Please also note the supplement to this comment:
https://gmd.copernicus.org/preprints/gmd-2022-114/gmd-2022-114-RC1-supplement.pdf