

Interactive comment on “A unified parameterization of clouds and turbulence using CLUBB and subcolumns in the Community Atmosphere Model” by K. Thayer-Calder et al.

Anonymous Referee #1

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Review of the Geoscientific Model Development paper entitled “A unified parameterization of clouds and turbulence using CLUBB and subcolumns in the Community Atmosphere Model”, by K. Thayer-Calder and co-authors.

This is an important paper on an essential topic in climate modeling. Developing and implementing more unified parameterizations of clouds, convection and boundary layer mixing is absolutely fundamental for future progress in climate prediction. The method developed and implemented by the authors is indeed a promising one. The paper, however, should not be published before some major revisions are performed that can significantly improve the paper in a fairly easy manner.

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Major issues:

1) The paper fails in framing their work in the context of previous research from a variety of perspectives. The main problem is that from reading this paper, the reader is left with the impression that this is basically the first time that pdf cloud parameterizations are used and implemented in atmospheric and climate models. However, cloud parameterizations based on pdf ideas have been proposed in the 1970s and there is a large body of literature over the years discussing pdf cloud parameterizations in atmospheric models: the authors should correct this serious oversight.

2) In addition, the authors fail to discuss in any detail some other topics/developments: How does their work relate to the more traditional developments of cloud microphysics implementation in climate models (and the coupling of microphysics with the other parameterizations)? How does their work relate to the development and implementation of other methods to unify the parameterizations of convection and boundary layer such as the recent ED-MF parameterization? How essential is the turbulence closure part of CLUBB in the context of their particular investigation?

3) This paper would improve significantly if the authors would include a couple of schematics illustrating how the pdf concept is coupled to the cloud microphysics. This is the key advancement of this work, and it deserves to be communicated better to the readers.

4) In the validation part it would be important if the authors would refer to the uncertainties inherent to each of the observational datasets that they are using. All observations have associated errors and the authors should provide a measure of the accuracy for each of the observations used.

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