

Interactive comment on “Parameterizing microphysical effects on variances and covariances of moisture and heat content using a multivariate PDF” by Brian M. Griffin and Vincent E. Larson

Anonymous Referee #3

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This paper formulates relations for the effects of microphysical terms on turbulence variance and correlations using a multivariate PDF. Overall, I found the introductory, overview, and methodology sections to be quite well written while providing a clear motivation for the work. However, I felt the results section seemed incomplete and could be expanded upon a bit to make for a more convincing and satisfying read. Please see the below list on topics I would recommend be addressed before publication could be considered.

1) How do the mean state fields compare between LES and CLUBB with the new

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parameterization? Can it adequately simulate the thermodynamic and cloud structure?

2) In relation to the above point, what is the effect of the new parameterization on the simulated cloud field? i.e. How does the new version of CLUBB compare to the control version of CLUBB? Providing this information will make the paper stronger by giving the reader a sense of the potential benefits of the new parameterization rather than just showing that the budget terms sort of match up.

3) Only one case is presented here. Oftentimes this is a warning sign that cherry-picking of the results or over-tuning of one case was the result. It would be nice if the authors somehow address this concern. Have the authors tested their parameterization on a stratocumulus over cumulus type of case?

4) Overall, the budgets from CLUBB reasonably match LES, although there are some instances where there are significant differences. I feel the authors brush this aside by saying improving these are “out of the scope” of the current work. I feel at minimum, a discussion should be included pertaining to potential reasons for these deficiencies and how improvements could be beneficial for an overall improved simulation of clouds (related to points 1 and 2).

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