

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 #2

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The authors compare an LES simulation to a single-column simulation with a model based on higher-order closure relations (CLUBB). Closure relations for the effects of microphysics on turbulent correlations are derived by integrating a simple microphysical model over assumed distribution functions for the fluctuating quantities.

The main use of this kind of comparison would be to improve the CLUBB model. Indeed, the figures show that there are large difference between the models at all heights. I was expecting the causes of these differences to be explored by sensitivity testing with CLUBB (or the LES) and concrete suggestions made for how the CLUBB could be im-

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proved to better represent the LES. There is a comment about this at the end section 4, with the suggestion that model improvements are ‘out of scope’, but without further exploration of the model differences the paper is somewhat dry and technical. I suggest that a major revision is necessary, to include an adequate exploration of the causes of the model differences.

I was expecting to see analytical results, somewhere in this paper, for the closed expressions for the microphysical covariances. The authors give expressions, e.g., Eq. (25), in terms of integrals, but do not actually evaluate the integrals in terms of the model prognostics. Given that it is the integrated expressions which are potentially useful to the reader, these should be given. This comment applies to the appendix as well.

The highly concise notation used in Section 2.2 for the PDFs is difficult to understand. Could it be replaced with one or two, well chosen, examples? If the fully-general expressions need to be recorded here, they could be moved to an appendix.

The figures comparing the LES and CLUBB often use different scales for the two models. This makes direct comparison difficult and should be corrected.

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