Interactive comment on "A new subgrid-scale representation of hydrometeor fields using a multivariate PDF" *by* Brian M. Griffin and Vincent E. Larson

Anonymous Referee #1

This paper describes a new PDF representation of the subgrid variability of hydrometeors implemented in the CLUBB scheme. The new method incorporates a delta function in the PDF at 0 that represents precipitation free regions of the grid. Much of the paper outlines the mathematical formulation of the new PDF. Testing of the new PDF is performed against three LES simulations. Incorporation of the delta function is shown to improve the microphysical process rates by reducing evaporation and increasing accretion thereby allowing larger amounts of precipitation to reach the ground. The paper is very well written and contains appropriate methods and references. I only have minor comments shown below.

Line 132: I can't quite follow why the relationship is approximate. I would have thought

that mean(N_cn) = mean(N_c)/cloud_fraction, which would be exactly the in-cloud mean. Could you clarify?

Figures 2,4,5,6: Values of $\ln(r\_r)$ less than about -11.5 are very small. Often even the DDL does not match these values well. However I would guess that they probably do not contribute appreciably to the total mass or the process rates. Is that correct? Is it worth commenting on the fact that even DDL does not represent the extremely small values well.

Line 536: looks like an erroneous '.' After precip.

Line 537: Again looks like an erroneous '.' After precip.

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