Geosci. Model Dev. Discuss.,
doi:10.5194/gmd-2015-280-RC2, 2016

Geoscientific Model Development Discussions
Open Access
EGU

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 #2

Received and published: 11 March 2016

Overall comment:

This paper provides an overview of the development of an extension to a PDF-based microphysics and cloud paramaterization method. The key development being the inclusion of flexibility to allow for cloud-free regions where there are no hydro-meteors. Although sections 2 and 3 are mathematically pretty heavy going, they are required to fully document the method being described.

Minor comments:

1)Presumably the LES simulations used here do not have time-evolving forcing. I presume they are runs for a period of time until some form of equilibrium is reached. If

Printer-friendly version

Discussion paper

that is case, it may be worth clarifying that these are run with non-evolving forcing.

2)If the simulations are indeed for steady-state conditions, could you discuss how applicable your method may be to time-evolving situations. Although the Tompkins scheme is dealing with a different problem, that scheme discusses the ill-posed nature of that mathematical framework at the point when cloud first appears in a previosuly cloud-free environment. Could you discuss whether your approach could deal with simulating the transition from clear to partially cloudy and the transition from precipitation free to precipitation in a portion of the domain. Is all of the math well-posed for these scenarios.

3)Although there is mention of horizontal correlation between species, for example for calculating accretion, there is no mention of vertical correlation and vertical overlap. Presumably the LES simulations have some vertical coherence and precipitation formed in cloud is more likely to be in a cloudy part of the domain as it falls to the next level down. Is this effect considered in your present work, or do falling precipitation particles experience a randomly selected portion of the layer they fall into. Please clarify whether and how you take this into account.

Typographical comments:

4)Line 75 and elsewhere. Instead of "in precip." and outside precip." I suggest using the un-abbreviated for "in precipitation" to avoid some periods appearing mid sentence. Suggest changing this through-out document.

5)Line 331 need rephrasing "The value of * can now be solved for through Eq 27."

6)Line 385. What was the model top?

7)Line 398. Suggest "and covering a domain of DEPTH 159.3 m." Similarly line 406 "a domain of DEPTH 27500m."

8)Line 455. Suggest "much closer match subjectively. A quantitative assessment will follow in the next section."

9)Line 495. Perhaps remind reader that a less subjective assessment will follow.

10)Line 493. Presumably this height was chosen as the hydro-meteors are all liquid-only at this height?

11)Near line 570, why are different time-averaging windows being used?

12)Line 565, no need for period after abbreviation of meter.

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2015-280, 2016.

Printer-friendly version

Discussion paper