Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2019-255-RC1, 2019

Geoscientific Model Development Discussions

Interactive comment on "Impact of scale-aware deep convection on the cloud liquid and ice water paths and precipitation using the Model for Prediction Across Scales (MPAS-v5.2)" *by* Laura D. Fowler et al.

Anonymous Referee #1

Received and published: 13 December 2019

The authors mainly use LWP and IWP retrievals to evaluate during 1 month two convection schemes with different version of "scale-awareness". The study is maybe not the most original but well done overall and the methodology is well described. Shortening of the manuscript and further clarification is required, see below -the term "scale-aware" is often used, but in practice what is done and what is the better term is "scale-adaptive" in contrast to "scale-aware" which would be a fully (3d) prognostic convective equation system -you describe the two schemes (scale-adaptivity) and you should point out that for GF the (1-sigma)ˆs factor is very small for grid-spacings <6 km, while

at 4-6 km we do not expect convection to be resolved -You should drop without loss of information Figure 9 -Figure 12, you should plot here instead the difference in RH with the ERA5 reanalyses and rewrite discussion l582-598 -page 25, discussion of upward moisture flux, I presume you mean the resolved =grid-scale moisture flux, but there is also the convective drying/moistening to be included -page 27, lines 640ff rewrite and shorten, not necessary to repeat each time general effect of switching off deep convection -Figure 14: please plot instead differences against your retrieved LWP - you might also drop Figure 15 but keep the results in the text saying that in GF it is comes from near equal contributions form the shallow convection scheme and the large-scale condensation 9Thmson microphysics) -You should put more emphasis on Figure 16 (please also use ERA5 as it is more accurate). However how did you compute the Preciptiable water below 700 hPa form reanalysis, as it is only available as the total column precipitable water? In case that your comparion is donne correctly you should mention that while MSKF seems to produce less and more realistic LWP it might be for the wrong reason as due to missing shallow convection the model is too dry. Also, are you sure that overestimation of LWP in GF is an error in the amount of condensate or only the phase (i.e it doesn't glaciate correctly) -lines 699-702: you say that the partitioning between liquid and ice might be responsible, yes, but you can/should check this, also it could be the different mass flux profile, ie upper level condensate detrainment -l730-733 "the strong upscaling effect of the refined grid mesh" I do not understand this too why –l738-740 please note again the MSKF might give the right answer in LWP for wrong reason (too dry) and you need to check out why GF overestimates, at least apparently overestimates LWP

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