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# Comment on gmd-2020-297

Hartwig Deneke (Referee)

Referee comment on "Towards an improved treatment of cloud–radiation interaction in weather and climate models: exploring the potential of the Tripleclouds method for various cloud types using libRadtran 2.0.4" by Nina Črnivec and Bernhard Mayer, Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-297-RC1, 2021

Review of Paper: "Towards an improved treatment of cloud-radiation interaction in weather and climate models: exploring the potential of the Tripleclouds method for various cloud types using libRadtran 2.0.4", submitted for publication in GMD.

The paper studies the ability of the TripleClouds method to reduce biases in radiative fluxes due to un-resolved inhomogeneities in coarse-resolution models. Overall, I find this study very interesting, with sound methodology and a good presentation. The only critical comment I'd like to raise that in some parts, the language could be improved, in particular some long sentences are too long/hard to follow. As such, I recommend the paper for publication after some minor technical corrections.

* As one of several very long sentences, I refer to an example sentence from the conclusions , which addresses several independent points simultaneously (physical understanding/cloud type dependence/parameter tuning/operational use). I strongly recommend to shorten such sentences, and address points eparately: “The acquired physical understanding of radiative biases, in particular those stemming from neglected cloud horizontal heterogeneity, for three fundamentally contrasting cloud case studies as highlighted in this work, is a necessary first step for properly setting the TC parameters in its possible future operational usage.”

Some additional comments on the text:

* L90: “which has received considerably less attention in the previous debates”: less than what?

* L 99: “...which requires an upgrade of vertical overlap rules” … “the maximum-random overlap was thus retained” => these phrases seem contradictory, maybe this can be written differently/more clearly.

* L138: “Diverse models employed to generate these cloud fields … ensure that the three selected cases comprise a wide range of inhomogeneity.” => This could be interpreted that the differences in models is mainly responsible for inhomogeneity. Isn’t it the main goal to reproduce inhomogeneity observed in nature? All in all, I think model and resolution-induced differences are something which cannot be avoided, rather than

something desirable.

* L262: “The difference between the ICA and 3-D was”: output? results? Word missing!

L528: “These findings are in support of cloud regime dependent approaches, which ought to be further boosted to be used in radiation schemes of next-generation atmospheric models.” Is “boosted” the right word here? At least to me, the meaning of this sentence is somewhat unclear (caveat: I am not a native English speaker)