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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A minimum bulk microphysics" *by* J.-I. Yano and D. Bouniol

Anonymous Referee #2

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FIRST REVIEW FOR ACP OF: A minimum bulk microphysics J.-I. Yano and D. Bouniol GAME/CNRS, CNRS-INSU-M′ et ′eo France, URA 1357, Toulouse, France

While the purpose to find a 'super-parameterization' is a very important one for larger scale modeling or climate modeling for present computational resources, the minimum bulk parameterizations and simplifications presented in the paper in question are not very novel and have either already been done by others (or done in ways that are quite similar) or are quite trivial (and maybe they need to be).

A lot of effort in this paper is spent on mixing old and overly and inappropriately used autoconversions. Mixing Kessler's and Berry's autoconversion was first done by Orville and Kopp (1977 JAS) more 34 years ago and again by Lin et al. (1983 JAM) some 28 years ago. These are tuned at an attempt to capture mid-latitude autoconversion. Interesting the Orville group eventually turned off autoconversion for high plains deep

convection (Lin et al. 1983) as it still over produced rain in their mixed-phase parameterization.

Other approaches such as fitting bin model results to develop autoconversion schemes like Berry (1968) were considered by Berry and Reinhart (1974 JAS) and more recently by Khairoutdinov and Kogan (2001 JAS), of which the latter is still ten years old. The latter scheme may not be appropriate for deep convection as it was tuned to stratocumulus drizzle production. The former approach was tuned to more tropical convective type convection and may not be appropriate for stratocumulus drizzle production. Neither approach is appropriate for deep stratiform ice-phase generated precipitation.

The authors' approach is yet another simplified set of autoconversions that goes without saying as being developed without much if any considerations of the physics of autoconversion as done most openly by Manton and Cotton (1977 in a technical memo; but a good description can be found in Tripoli and Cotton 1980 JAM). Too be sure, a good auto conversion scheme, even a simple one can be generated for various scenarios if many of the physics are included as described in Cotton and Anthes (1989) book.

To make the paper novel the authors should really try to consider a minimum, mixed-phase bulk parameterization. I know this would be extra work. Yet even this has been done to some extent and already has been considered in the literature at least once (e.g., Grabowski 1998 JAS). So I don't know how novel this would be.

There are simple ways of taking into account the ice phase by choosing a condensation / evaporization scheme that change to a deposition / sublimation scheme at cold and appropriate temperatures and by using snow terminal velocities instead of rain terminal velocities also at cold and appropriate temperatures and still have a very minimum bulk microphysical scheme. I suppose that melting could or be included in a very simple manner, or could be incorporated as simply as by changing precipitation terminal velocity back to that of rain at warmer temperatures. I think before publication the au-

thors should consider these changes other wise the advance to science is flat if not a step backward compared to Grabowski's 1998 attempt.

By trying to capture some essence of the ice phase as suggested above the authors might capture some essence of stratiform precipitation as is usually found with this type of convection in the middle and tropical latitudes.

I hope the authors will consider these suggestions.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 30305, 2010.