

Interactive
Comment

Interactive comment on “Evaluation of a new convective cloud field model: precipitation over the maritime continent” by H.-F. Graf and J. Yang

Anonymous Referee #2

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This paper reports an effort of evaluating the “convective cloud field model” (CCFM) developed by the authors in simulating precipitation over the western Pacific region. The simulations are done for a full year period using a limited-area climate model with 0.5 degree horizontal resolution coupled with either CCFM or a standard convection parameterization scheme (Tiedtke scheme). To assess the performance of CCFM, the modeled precipitation patterns have been compared to the GPCP precipitation estimation as well as the modeled results using the standard convection scheme.

CCFM was developed as an alternative method to the whole school of other attempts to represent contributions of convective clouds in models that cannot explicitly resolve these clouds. Obviously, the performance of the method needs to be evaluated and thus documented. The results of this paper are hence informative to the convection

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parameterization community and also to those who are interested in the method itself. The paper is relatively well written. However, in my opinion the authors need to clearly address several issues before the acceptance of the paper for publication.

General Comments

The central piece of CCFM is a 1D cloud model developed in late 1960s, which is only useful for simulating certain types of clouds specifically excluding the mesoscale convective system and deep convection. The contributions of convective clouds are appreciated by combining the effects of an ensemble of cloud types. The type of cloud is defined by two parameters, i.e., the initial radius and cloud base vertical velocity. When CCFM is applied to a relatively high-resolution model such as the one used in this study, the size of the model domain does limit the total number of clouds allowed to be inside each grid box, however, it should not restrict the sizes of these clouds in theory. Apparently, as described in the text the authors have performed several arbitrary modifications including applying a limitation to the cloud initial radius. Therefore, perhaps the much reduced convective precipitation derived using CCFM comparing to that derived from the standard run can be attributed to these modifications.

It would be a best solution that the authors perform additional runs with a coarse resolution than this one to respectively include and exclude CCFM, or runs with the same resolution but with an alternative restriction on the initial cloud radius (such as 1/3 of the PBL height). Cloud properties such as top and size to a large extent determine the precipitation amount of a convective cloud. The authors need to demonstrate if there is a difference in the statistics of modeled convective cloud properties between different runs and, should it exist, the factors that had caused this difference.

Specific Comments

Page 10225 (online version), line 1-24, Figure 2: I notice that the winter precipitation peak in CCFM run shifted for a month compared to GPCP and Tiedtke scheme. Why?

Page 10227, line 24-29: Selecting only the time steps corresponding to convective precipitation seems an unfair sampling to me. Should it be done at least by selecting time steps when either large scale or convective precipitation occurs?

Page 10228, section 17-18: If most of the extreme precipitation events occur over the land, the CCFM overestimation of land precipitation might not necessarily be a bad result. On the other hand, the underestimated precipitation over the oceans by CCFM might be interpreted as an underestimation of precipitating events there. What are the potential reasons for these results? Can the authors provide the difference between modeled cloud properties over the land and ocean?

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 10217, 2006.

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