



Use of Partial Cloudiness in a Cloud Microphysics Scheme and Its Impact on Precipitation Processes and Large-Scale Circulation

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Effect of partial cloudiness on the microphysical processes is included in a single-moment bulk cloud microphysics scheme. Based on the statistical relationship between cloud condensate amount and cloud fraction, all hydrometeors are treated as in-cloud values in the microphysical processes. This approach increases the amount of rain and snow by enhancing accretion rates and increases surface precipitation. In global-model simulations during a boreal summer, altered hydrometeor distribution by the partial cloudiness effect leads to a more realistic representation of radiative fluxes. Interaction between cloud and radiative processes modulates convective activity, and consequently alleviates excessive tropical precipitation over the western Pacific warm pool region. Inclusion of the partial cloudiness effect not only affects the local precipitation processes over this region but also alters vertical motions in the tropical central and eastern Pacific regions by modulating large-scale circulation.