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CONSIDERATION OF DYNAMICAL EFFECTS ON PARAMETERIZATION OF CLOUD RADIATIVE PROPERTIES

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ABSTRACT

Radiative properties of clouds are often expressed as a function of effective radius (the ratio of the third to second moment of the cloud droplet size distribution and denoted by r_e). The value of r_e in turn needs to be parameterized, and the most commonly used parameterization is $r_e = a (L/N)^{1/3}$, where L is the cloud liquid water content, N is the total droplet number concentration and a is an increasing function of the relative dispersion of the cloud droplet size distribution (the ratio of the standard deviation to the mean radius of the cloud droplet size distribution). A positive correlation has been recently found between droplet concentration and relative dispersion, and this relationship significantly affects the evaluation of indirect aerosol effects.

However, the relationship between relative dispersion and droplet concentration suffers from large uncertainties because it does not account for the effects of cloud dynamics. We seek to reduce the uncertainties in the parameterization of effective radius caused by different cloud dynamics. Data collected in continental stratocumulus clouds over the Southern Great Plains (SGP) site of the Atmospheric Radiation Measurements Program (ARM) are used in the analysis. The results of this study are useful for improving representation of clouds in climate models and for remote sensing of cloud properties.

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