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Cloud Overlap of Cumuliform Clouds in the Shallow Boundary Layer

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Abstract

Cloud albedo, or the proportion of sunlight reflected by a cloud, has a significant impact on the Earth’s radiation budget and is strongly influenced by cloud shape. It is a major source of uncertainty in climate modeling. To characterize the shape of shallow cumulus clouds we study the behavior of the cloud overlap ratio, the ratio between the average cloud fraction and projected cloud cover. In this study, we use a high resolution computer model (LES) to 1) determine how the cloud overlap ratio of a cloud field is related to the overlap of individual clouds, and 2) to study how the cloud overlap behaves under different atmospheric circumstances. We find that the overlap ratio does not vary much between different cases or cloud heights, but it is sensitive to cloud layer depth and that the smallest clouds in a field contribute a negligible amount to the albedo.