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P3: What Determines the Shape of a Cloud?

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Abstract

Current climate models and weather forecasts suffer due to an uncertainty associated with the behavior of clouds, which directly impact the energy exchange between the earth and the Sun. This impact is determined in part by the shape of the clouds, thereby making the study of what affects cloud shape an area of interest. To characterize the shape of cumulus clouds we study the behavior of the cloud overlap ratio, or the ratio between the average cloud fraction and projected cloud cover. In this study, we used a high resolution computer model to 1) determine how the cloud overlap ratio is related to the height and layer depth of clouds where it is defined, 2) to study how the overlap behaves under different physical circumstances, and 3) to study how the fractal nature and wind shear impact cloud shape. We found that the shape is sensitive to cloud layer depth, the fractal nature and wind shear; but not to cloud height, time of day or location of the cloud field.