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Which Clouds are Important: Variation of Cloud Size Distribution Functions in Large Eddy Simulations

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Abstract

Accurately measuring and modeling clouds is an important factor in improving weather and climate prediction. One way of measuring the most important cloud size in a cloud field is a cloud size distribution (CSD) function, or the number of clouds per cloud size within the field. The information from a cloud size distribution can then be used to determine which cloud sizes contribute the most to cloud cover. This research focuses on creating and comparing cloud size distributions for a variety of cumulus cloud fields generated by Large Eddy Simulations (LES), a high resolution computer model. Our work found that the majority of the cloud fields followed the same functional form of a power law with a scale break, or change in exponent at larger cloud sizes. However, considerable variation was found in the value of the exponents and scale break location between different cloud fields, while some fields had no scale break at all. This is in contrast with previous studies that showed the scale break was the only changing element. We suggest that this discrepancy is caused by small domain sizes in previous studies limiting large cloud formation.