

The Environment of Aggregated Deep Convection

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In this study, the environment of aggregated deep convection is investigated using a vector vorticity equation cloud-resolving model (VVM). Idealized experiments are performed under various environmental moisture with or without imposed vertical wind shear. Convective aggregation is then evaluated through diagnosing the 3-D size of an individual cloud from the model output using a six-connected segmentation method.

The aggregated convection is recognized by a distinct mode with larger size in the cloud size distribution. The results suggest that aggregated convection tends to develop when column relative humidity (CRH) is larger than 80% (67%) in non-shear (shear) cases. In addition, the degree of aggregation further increases with the increase of CRH. This aggregation process may be caused by an increasing probability of multi-cellular cloud structure under a moister environment. The results suggest that there are at least 5 core-updrafts of such system. Analyses of precipitation distribution suggest that the probability of extreme precipitation increases with the increase of aggregated convection. The favorable environment of aggregated convection can be used to improve convective parameterizations in large-scale models.

Keywords: cloud-resolving model, aggregated convection, extreme precipitation

