

How weakened cold pools facilitate convective self-aggregation

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In radiative-convective equilibrium (RCE) simulations, convective self-aggregation (CSA) is the spontaneous organization into segregated cloudy and cloud-free regions. Evidence exists for how CSA is stabilized, but how it arises favorably on large domains is not settled. Using large-eddy simulations (LES), we link the spatial organization emerging from the interaction of cold pools (CPs) to CSA. We systematically weaken simulated rain evaporation to reduce maximal CP radii, R_{\max} , and find reducing R_{\max} causes CSA to occur earlier. We further identify a typical rain cell generation time and a minimum radius, R_{\min} , around a given rain cell, within which the formation of subsequent rain cells is suppressed. Incorporating R_{\min} and R_{\max} , we propose a toy model that captures how CSA arises earlier on large domains: when two CPs of radii $r_{i,j} \in [R_{\min}, R_{\max}]$ collide, they form a new convective event. These findings imply that interactions between CPs may explain the initial stages of CSA.

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