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Merge or die - how long-lived convective events develop in cold pool-suppressed self-aggregation

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Under radiative convective equilibrium (RCE), cloud populations can spontaneously segregate into cloudy and cloud-free subregions, a process known as convective self-aggregation (CSA).
Cold pools (CPs) have been shown to inhibit and sometimes prevent CSA. Here, we suppress CPs by removing the re-evaporation of rain in Large Eddy Simulations and cloud resolving simulations, which we run for 10-20 days.

Without CPs individual rain events persist up to tens of hours in the course of this modified CSA. The rain locations correspond to local convection cells, which seem to merge and grow or to shrink and fade over time. Each convective updraft corresponds to a stable fixed point of the near-surface horizontal wind field, and its 'basin of attraction'represents the area from which surface winds collect moisture. We extract the location of the updraft and the area of these basins from the data.
With these two quantities we can reconstruct the main dynamics in a model by assuming an incompressible flow and homogeneous subsidence everywhere but for the point-like updrafts.

This extreme CP-free case will help understand the role of CPs in the formation of CSA and may also be relevant in occasions, when rain re-evaporation is very low, because humidity is nearly saturate in the boundary layer, which may be the case for some oceanic areas.

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