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# Radiative controls on the speed of growth of deep convective self-aggregation

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In idealized cloud-resolving models, convective self-aggregation, or organization, develops from small dry patches that expand until they cover a large fraction of the domain. This study investigates the drying tendency associated with radiatively-driven subsidence and its possible link to the timescale of transition from a non-organized to an organized state. Indeed, understanding the dynamics involved in this transition appears as a first crucial step to connect idealized simulations with observations of the real atmosphere: making this connection has been difficult because properties of aggregated states in equilibrium depend strongly on model configuration (domain size and shape, resolution, etc.), while the growth phase provides a different and unexplored angle to look for universal properties of self-aggregation.

We perform simulations with the System for Atmospheric Modeling (SAM), with no rotation and no vertical wind shear, focusing on the dynamics of the boundary between moist and dry regions. We use a local moisture budget and choose three definitions of the moist margin in order to track some of its properties over time: (a) the strength of maximum horizontal moisture gradients, (b) the drying tendency associated with radiatively-driven subsidence in the upper troposphere close to the convecting region, and (c) the drying tendency at low levels in the driest regions that likely reinforces a shallow atmospheric circulation that strengthens aggregation.

We assess the robustness of these controls for different SSTs and different domain configurations, before commenting on the possible role of self-aggregation in strengthening humidity gradients in the tropics. These domain-independent metrics based on local thermodynamic quantities will allow for an easier comparison with observations in the future.

**Primary authors:** FILDIER, Benjamin (Laboratoire de Météorologie Dynamique, ENS, Paris); MULLER, Caroline (CNRS/LMD)

**Presenter:** FILDIER, Benjamin (Laboratoire de Météorologie Dynamique, ENS, Paris)

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