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The diurnal path to persistent convective self-aggregation

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Convective self-aggregation (CSA) has attracted a lot of attention as a possible explanation for large scale tropiccal weather phenomena such as the Madden-Julian oscillation and cyclo-genesis. However, CSA is hampered in the realistic limit of fine model resolution when cold pools—dense air masses beneath thunderstorm clouds—are well-resolved.

Here we mimic the diurnal cycle in cloud-resolving numerical experiments by prescribing a surface temperature oscillation. Our simulations show that the diurnal cycle enables the formation of persistent dry patches closely resembling the early onset of CSA. In fact, the dry-patch formation is accelerated by finer resolutions. We attribute these findings to the highly non-linear dynamics of large 'combined cold pools'emerging in symbiosis with mesoscale convective systems. Our results may help connecting CSA paradigm in favor of more realistic simulations.

A preprint of the findings are available at: arXiv:2104.01132

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