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The Role of Radiation in Organizing Tropical Convection[1]
SHARON SESSIONS, STIPO SENTIC, MICHAEL HERMAN, DAVID RAYMOND, New Mexico Institute of Mining and Technology — Convective organization regulates the radiation emitted to space, and therefore is important for the global heat budget. Organized convection–regions of intense convection surrounded by large cloud-free regions–permit more longwave radiation to escape and therefore may constitute a net cooling effect, while more scattered convection promotes greenhouse warming. Models which simulate the spontaneous organization of deep tropical convection–self-aggregation–suggest that radiative cooling in response to water vapor content is essential for convection to spontaneously organize. Multiple equilibria–steady states which maintain persistent precipitating convection or are completely dry–in small domains with weak temperature gradients (WTG) are analogous to dry and moist regions in larger scale simulations of convective self aggregation. We explore the role of radiative cooling in multiple equilibria. Interactive radiative cooling suppresses convection in the dry state and it permits multiple equilibria over a larger parameter range. However, multiple equilibria still exist with fixed radiative cooling. This suggests that while interactive radiation is conducive for organizing convection, it is not essential. This study elucidates radiation's role in convective organization.

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