Abstract Submitted
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A Lagrangian network-based analysis of evaporative droplets in Rayleigh-Benard convection[1] THEO MACMILLAN, DAVID RICHTER, University of Notre Dame — Rayleigh-Benard convection is characterized by different scales of coherent motion, from a large-scale circulation (LSC) to transient thermal plumes. To better understand the mixing behavior of evaporative droplets in such a system, we assemble a time-evolving weighted network from the droplets' individual trajectories using direct numerical simulation (DNS) with Lagrangian droplet tracking. By varying the time over which the network is assembled, we detect both the LSC and transient thermal plumes in the spectral gap of the network's Laplacian while accurately determining their respective time scales. Using tools developed for the analysis of complex graphs, we are able to objectively characterize the limiting cases of homogeneous (slow microphysics) and heterogeneous (fast microphysics) mixing and the interplay between short time-scale coherent structures and the LSC in the dynamics of the droplet ensemble. This has implications for understanding, for example, essential mechanisms of the formation of rain, including cloud entrainment and droplet spectra broadening processes such as stochastic condensation.

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