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Dynamical Clustering in Reaction-Dispersal Processes on Complex Networks VINCENT DAVID, MPI-DS, Goettingen, MARC TIMME, MPI-DS, BCCN, Goettingen, THEO GEISEL, University of Goettingen, MPI-DS, BCCN, Goettingen, DIRK BROCKMANN, Northwestern University, Evanston — We investigate nonlinear annihilation processes (e.g., $A + A \to \emptyset$) of particles that perform random walks on complex networks. In well mixed populations (mean field) this process exhibits t^{-1} decay behavior in the total number of particles. Additional dispersal of particles adds a second time scale and drastically changes the decay behavior. Here we study these changes for two types of hopping processes. First, if particles independently select one of the possible exit channels at each node their exit rates are given by the sum of all outgoing weights such that the waiting times are degree-dependent. We compare this to the popular ansatz of a uniform waiting time process. Derived mean field equations show that for large numbers of particles per node both processes exhibit nearly identical relaxation properties. However, below a critical particle number the processes deviate not only from mean field predictions but, more importantly, by orders of magnitude from one another. We attribute this to dynamical clustering effects in the uniform waiting time model, that is absent in the independent channel dynamics.

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