We study features of the longtime behavior and the spatial continuum limit for the diffusion limit of the following particle model. Consider populations consisting of two types of particles located on sites labeled by a countable group. The populations of each of the types evolve as follows: each particle performs a random walk and dies or splits in two with probability $//frac{1} {2}$ and the branching rates of a particle of each type at a site x at time t is proportional to the size of the population at x at time t of the other type. The diffusion limit of small mass, large number of initial particles is a pair of two coupled countable collections of interacting diffusions, the mutually catalytic super branching random walk.Consider now increasing sequences of finite subsets of sites and define the corresponding finite versions of the process. We study the evolution of these large finite spatial systems in size-dependent time scales and compare them with the behavior of the infinite systems, which amounts to establishing the so-called finite system scheme. A dichotomy is known between transient and recurrent symmetrized migrations for the infinite system, namely, between convergence to equilibria allowing for coexistence in the first case and concentration on monotype configurations in the second case.Correspondingly we show in the recurrent case both large finite and infinite systems behave similar in all time scales, in the transient case we see for small time scales a behavior resembling the one of the infinite system, whereas for large time scales the system behaves as in the finite case with fixed size and finally in intermediate scales interesting behavior is exhibited, the system diffuses through the equilibria of the infinite system which are indexed by the pair of intensities and this diffusion process can be described as mutually catalytic diffusion on $(//R^)^2$. At the same time, the above finite system asymptotics can be applied to mean-field systems of N exchangeable mutually catalytic diffusions. This is the building block for a renormalization analysis of the spatially infinite hierarchical model and leads to an association of this system with the so-called interaction chain, which reflects the behavior of the process on large space-time scales.Similarly we introduce the concept of a continuum limit in the hierarchical mean field limit and show that this limit always exists and that the small-scale properties are described by another Markov chain called small scale characteristics. Both chains are analyzed in detail and exhibit the following interesting effects. The small scale properties of the continuum limit exhibit the dichotomy, overlap or segregation of densities of the two populations, as a function of the underlying random walk kernel. A corresponding concept to study hot spots is presented. Next we look in the transient regime for global equilibria and their equilibrium fluctuations and in the recurrent regime on the formation of monotype regions.For particular migration kernels in the recurrent regime we exhibit diffusive clustering, which means that the sizes (suitable defined) of monotype regions have a random order of magnitude as time proceeds and its distribution is explicitly identifiable. On the other hand in the regime of very large clusters we identify the deterministic order of magnitude of monotype regions and determine the law of the random size. These two regimes occur for different migration kernels than for the cases of ordinary branching or Fisher-Wright diffusion. Finally we find a third regime of very rapid deterministic spatial cluster growth which is not present in other models just mentioned. A further consequence of the analysis is that mutually catalytic branching has a fixed point property under renormalization and gives a natural example different from the trivial case of multitype models consisting of two independent versions of the fixed points for the one type case.

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