Abstract Submitted
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An analytically tractable model for community ecology with many species[1] BENJAMIN DICKENS, Department of Physics, Boston University , CHARLES FISHER, Bayesian Inference Group, Pfizer, Cambridge, MA, PANKAJ MEHTA, Department of Physics, Boston University , PANKAJ MEHTA BIOPHYSICS THEORY GROUP TEAM — A fundamental problem in community ecology is to understand how ecological processes such as selection, drift, and immigration yield observed patterns in species composition and diversity. Here, we present an analytically tractable, presence-absence (PA) model for community assembly and use it to ask how ecological traits such as the strength of competition, diversity in competition, and stochasticity affect species composition in a community. In our PA model, we treat species as stochastic binary variables that can either be present or absent in a community: species can immigrate into the community from a regional species pool and can go extinct due to competition and stochasticity. Despite its simplicity, the PA model reproduces the qualitative features of more complicated models of community assembly. In agreement with recent work on large, competitive Lotka-Volterra systems, the PA model exhibits distinct ecological behaviors organized around a special ("critical") point corresponding to Hubbell's neutral theory of biodiversity. Our results suggest that the concepts of "phases" and phase diagrams can provide a powerful framework for thinking about community ecology and that the PA model captures the essential ecological dynamics of community assembly.

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