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Noise-Induced Versus Intrinsic Oscillation in Ecological Systems

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Abstract

Studies of populations oscillating through time have a long history in ecology as these dynamics can help provide insights into the causes of population regulation. A particularly difficult challenge is determining the relative role of deterministic versus stochastic forces in producing this oscillatory behavior. Another classic ecological study area is the study of spatial synchrony which also has helped unravel underlying population dynamic principles. One possible approach to understanding the causes of population cycles is based on the idea that a focus on spatiotemporal behavior, oscillations in coupled populations, can provide much further insight into the relative role of deterministic versus stochastic forces. Using ideas based on concepts from statistical physics, we develop results showing that in a system with coupling between adjacent populations, a study of spatial synchrony provides much information about the underlying causes of oscillations. Novel, to ecology, measures of spatial synchrony are a key step.

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