

# Spatio-temporal Dynamics in Ecology:

## a key to understanding mechanism and process



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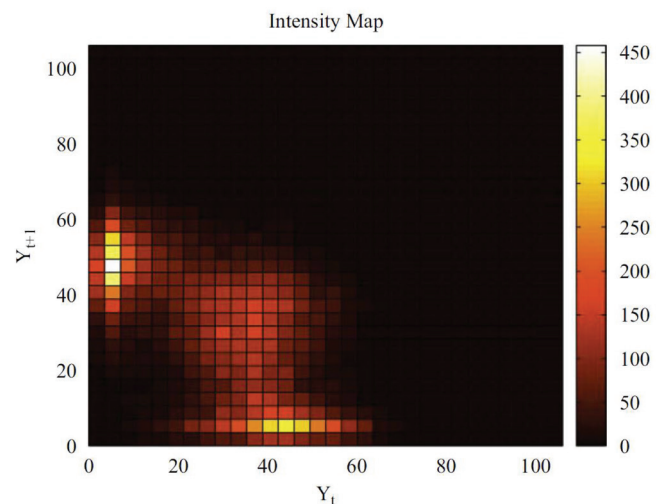
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### Abstract:

I will describe the importance of understanding spatiotemporal dynamics in ecology, beginning with a number of examples, both empirical and theoretical. I will discuss a number of systems where the study of spatiotemporal dynamics has provided insights into mechanisms. I will describe issues of synchrony in just two coupled populations that lead to interesting mathematical results. Then I will develop models that we have analyzed that show the presence of long range synchronization since the transition from incoherence to long-range synchronization of two-cycle oscillations in noisy spatial population models is described by the Ising universality class of statistical physics. This result shows, in contrast to all previous work, how the Ising critical transition can emerge



directly from the dynamics of ecological populations and provides new explanations for the appearance of synchrony in ecological populations. I will describe how these theoretical results are consistent with extensive data from a pistachio orchard, leading to new predictions about ecological dynamics. Then I will discuss open questions and future directions.