Mechanisms Causing the Transition Between Spatial Pattern Long Transients

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Regular self-organized spatial patterns can be observed in many ecological systems. Some such patterns are quasi-stable; that is, they can switch to a different spatial pattern on a relatively short time scale in the absence of external changes in environmental conditions, aside from minor stochastic events. They are referred to as long transients. Although long transients have been studied mathematically, the detailed mechanisms by which a pattern can suddenly switch in nature are not well understood. Here we study, through spatial simulation of spatial patterns in a realistic model of an empirically-based system, a new type of a rock-scissors-paper striped pattern traveling wave, which can switch to different spatial patterns through minor stochastic events. Study of the simulations allows the causal chains involved in the switch to be determined in precise ecological detail by focusing on local interactions. In particular, we show that in real ecological systems, even though they may be resilient over long time-periods, there can be vulnerabilities, including time lags in some interactions, which even tiny perturbations can eventually expose. Such perturbations can produce an instability that grows, completely changing an initial pattern to an alternate pattern. The results have broad applicability to ecological systems of interest. nter your abstract here.

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