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Dynamic Phase Transitions in Driven Cyclic Kinetic Networks TODD GINGRICH, SURIYANARAYANAN VAIKUNTANATHAN, PHILLIP GEISSLER, Univ of California - Berkeley — Many physical processes can be modeled by Markovian rate processes. When detailed balance is broken, as is generically the case in biological processes, the dynamics exhibits nonvanishing fluxes around cycles and produces entropy. We demonstrate that a particular class of kinetic networks, those with a nearly periodic, pseudo-one-dimensional cyclical character, yield a nontrivial statistics of the large deviations in the observed fluxes. This behavior can be understood analytically in the limit of large networks, where we demonstrate the existence of a dynamic phase transition. The observation suggests that interesting, and potentially useful, large dynamical fluctuations are common even in rate processes with a single degree of freedom. As the analysis holds for networks driven out of equilibrium, potential application to biologically relevant networks is especially intriguing.

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