Control of Turing Patterns via Temporal Forcing and Layering

Anne Catlla

Abstract

Abstract: Turing patterns, spatial patterns in reaction-diffusion systems, were first proposed for biological systems, but have been explored in greatest detail in chemical reactions. Experiments on the CDIMA chemical reaction show that external periodic forcing can suppress Turing patterns [Horvath, Dolnik, et al., PRL, 1999], and more recent experimental and numerical work has explored the effects of layering reaction-diffusion systems. Using symmetry and perturbation analyses of reaction-diffusion systems near a Turing-Hopf bifurcation, we determine conditions under which forcing suppresses or enhances patterns and predict how this effect scales with forcing amplitude and frequency. We also describe an approach for determining parameters that will allow for bifurcations to desired patterns in a layered system.