SINGULAR AND JUMP-DISCONTINUOUS PATTERNS IN REACTION-DIFFUSION-ODE MODELS

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Abstract

In this talk we explore mechanisms of pattern formation arising in processes described by a system of a single reaction-diffusion equation coupled to ordinary differential equations. Such systems of equations arise, for example, in modeling of interactions between cellular processes and diffusing growth factors. Our theory applies to a wide class of pattern formation models with an autocatalytic non-diffusing component. We show that the lack of diffusion in some model components may lead to instability of all regular stationary patterns and emergence of stable patterns with jump discontinuity or of singular spike patterns. Investigation of such structures pose challenges for mathematical analysis as well as numerical simulation and visualisation of the model solutions. We discuss analytical and numerical aspects of the proposed models as well as interpret the results in context of biomedical applications. Moreover, we find a class of reaction-diffusion-ode models with DDI-induced blow-up of spatially heterogenous solutions.

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REFERENCES