Nonstationary patterns in a degenerated reaction-diffusion model

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In this talk we explore a mechanism of pattern formation arising in the processes described by a system of a single reaction-diffusion equation coupled with ordinary differential equations. Such models can also exhibit diffusion-driven instability. However, they are very different from classical Turing-type models and the spatial structure of the pattern emerging from the destabilisation of the spatially homogeneous steady state cannot be concluded from a linear stability analysis. The models exhibit qualitatively new patterns of behaviour of solutions, including a strong dependence of the emerging pattern on initial conditions and quasi-stability followed by rapid growth of solutions. We show existence and instability of both regular and discontinuous spatially homogeneous solutions. In numerical simulations, solutions having the form of periodic or irregular spikes are observed.

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