

Wavefront for reaction-diffusion systems with degenerate diffusivity

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This talk explores the dynamics of systems governed by two coupled reaction-diffusion equations, wherein one component exhibits doubly degenerate diffusivity. These systems lack total mass conservation, separating them from standard scalar reaction-diffusion equations. We focus on searching for wavefront solutions, namely those that exhibit profiles with a constant speed of propagation characterized by a pair of strictly monotone functions. Through the application of shooting methods and fixed-point techniques, we establish conditions for the existence of these wavefronts and provide estimates for threshold speeds. Moreover, we discuss wavefront regularity and prove that all profiles are smooth except for the one at the threshold speed, which displays a distinct “sharp” behavior. Such models are frequently encountered in studying the spatial-temporal development of bacterial colonies on nutrient-rich agar plates.

The talk is based on joint works with L. Malaguti and V. Taddei (University of Modena and Reggio Emilia) and E. Muñoz-Hernández (Complutense University of Madrid).