

Reaction-diffusion and propagation in non-homogenous media

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Abstract:

The classical theory of reaction-diffusion deals with nonlinear parabolic equations that are homogenous in space and in time. It analyses travelling waves, long time behavior and the speed of propagation. More general, heterogeneous reaction-diffusion equations arise naturally in models of ecology, biology and medicine that lead to challenging mathematical questions. In this series of lectures, after reviewing fundamental results of the classical theory, I will describe recent progress on models that involve spatially heterogeneous non-linear parabolic and elliptic equations. I will also consider cases with non-local diffusions. The course will involve the following themes:

1. Review of the classical theory of homogenous reaction-diffusion equations.
2. The effect of a line with fast diffusion on Fisher-KPP invasion.
3. The effect of domain shape.
4. Models with non-local operators.
5. Propagation and spreading speeds in non-homogeneous media.