

Structure, dynamics, and approximation of cross-diffusive mixtures with incomplete diffusion

Katharina Hopf

In population dynamics, cross-diffusion refers to the phenomenon where the density gradient of one species induces a drift in a different species. Mathematically speaking, cross-diffusion equations are quasilinear second-order systems of partial differential equations often featuring an additional structure related to their physical origin. Much of the existing theory on cross-diffusions is confined to Petrovskii parabolic systems.

In this talk, we focus on a cross-diffusion system arising in population biology whose diffusion matrix is rank deficient, thus giving rise to an *incomplete* diffusion process. We exhibit a symmetric hyperbolic–parabolic structure of the PDE system and hence the short-time well-posedness of the Cauchy problem in spaces of smooth functions. By means of an extended framework of measure-valued solutions, we further discuss the long-time behaviour for large data as well as (numerical) approximation properties.

This talk is based on joint works with Pierre-Etienne Druet and Ansgar Jüngel.