Entropy method for a coupled reaction-diffusion system on the real line

Stefanie Schindler (WIAS)

In this talk, we investigate the long-time behavior of solutions to a nonlinear coupled reaction-diffusion system with detailed balance on the real line. By assuming that the solutions are in equilibria at infinity, we study the convergence towards a self-similar profile, which is a generalized steady-state in parabolic scaling variables. With this convergence, we answer how the solutions to the system mix the two stable asymptotic boundary values when time increases. Our strategy is to use an entropy approach with the relative Boltzmann entropy functional. This is a standard method for reaction-diffusion systems of mass-action type on bounded domains and a meaningful alternative to the linearization around an equilibrium. While this approach is well-studied on bounded domains, things become more complicated on the whole real line.

This research is joint work with Alexander Mielke.