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*Steady states and evolution of dispersal in river networks*

Steady states of nonlinear reaction-diffusion-advection (RDA) models can be viewed as solutions of a system of two first order ODEs (subject to appropriate boundary conditions). Geometrically, they are represented by orbits in the phase plane, generated by the corresponding flow operator. In this talk, I will discuss applications of the phase plane technique in a logistic RDA model in a river network setting. Here, a steady state is represented by a configuration of orbits in the corresponding phase plane satisfying geometric constraints induced by junction and boundary conditions. While in a single river case the basic shape of the steady state is determined by the boundary conditions, in the case of a river network, it is significantly affected by the geometry of the network (lengths of the segments and their cross-section areas). In a joint work with F. Lutscher and D. Smith, we exploit this phenomenon in the context of evolution of dispersal in a Y-shaped network. Namely, we consider the possibility of invasion of a steady state of a resident species by a species with different diffusivity. It turns out that the outcome of this interaction depends on the geometry of the network as well.