CHUNHUA OU, Memorial University of Newfoundland

Selection of the asymptotic spreading speed to the diffusive Lotka-Volterra competition model

In this talk, we will summarize our recent findings on the invasion speed (asymptotic spreading speed) to the the diffusive Lotka-Volterra competition model. This speed happens to be the minimal speed of traveling waves of the system, an important phenomenon in the study of mathematical biology, but the determinacy of the speed is challenging. By using both the parabolic and elliptic techniques in partial differential equations as well as a perturbation argument in a weighted functional space, we first derived a necessary and sufficient condition on the nonlinear selection which solves the conjecture raised by Roques et al. (J. Math. Biol., 2015). Furthermore, we established some easy-to apply criteria for linear and nonlinear selections in terms of lower (or upper) solutions with specific fast (slow) decay rate only, and we don't need to construct the couple of them simultaneously. This helped to easily obtain a number of explicit(analytic) results which gives estimates of the transition value in various situations. In particular, we established new results on the linear selection that doesn't require the system to be sub-linear on the direction of the positive eigenvector(Lewis, Li and Weinberger, 2002). Under certain conditions, we proved the Hosono's conjecture, but also pointed out failures of the conjecture in some cases. Our methods don't rely on the classical phase plane analysis and can be extended to work on any inhomogeneous system (including periodic systems and periodic habitats). This is a joint work of my team consisting of graduate students and visiting scientists.