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1 :  Persistence versus extinction under a climate change in mixed environments

Abstract : I will present my results about the persistence criteria under an effect of climate change in the mixed environment modeled by Fisher-KPP equation. we first consider a more general model than the model proposed by H.Berestycki, O. Diekman, K. Nagelkerke, P. Zegeling in 2009  in infinite cylindrical domain, where the environment is only assumed to be globally unfavorable with favorable pockets extending to infinity. We consider in two frameworks: the reaction term is time-independent or time-periodic dependent. For the latter, we study the concentration of the species when the environment outside the domain becomes extremely unfavorable and further prove a symmetry breaking property of the fronts.

2 : On generalized principal eigenvalues for nonlocal elliptic operators and applications

Abstract :  I will present some results in the joint work with Berestycki and Coville about the nonlocal elliptic operators. New properties about the limits of the principal eigenvalue with respect to the dispersal rate and dispersal range are proved in the joint work. Variational characterization are proved to help us in achievement of the equivalence of the different definitions of the eigenvalue. The long time behavior of the Fisher-KPP equation with nonlocal dispersal is also concerned this talk.

3 : The generalized principal eigenvalues for time-periodic nonlocal operators and applications.

In this joint work with Z. Shen, we extended the results in the joint work with Berestycki and Coville to time-periodic nonlocal operators. We need to make use another spectral theory to prove a comprehensive condition for existence of eigenvalue of the time-periodic nonlocal operators. New difficulties arise in the study of properties of the principal eigenvalue due to the lack of  usual L2 variational formula for the principal eigenvalue, the lack of the regularizing effects of the semigroup generated by the nonlocal dispersal operator. We also establish the maximum principle for time-periodic nonlocal operators.