Thesis Seminar

Speaker

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1pm, HH-3017

Evolution dynamics of some population models in heterogeneous environments

Abstract:
Spatial and/or temporal evolutions are very important topics in epidemiology and ecology. In this talk, we will talk about the global dynamics of some population models incorporating with environmental heterogeneities.

Vector-borne diseases such as West Nile virus and malaria, pose a threat to public health worldwide. To understand the role of seasonality on disease spread, we start with a periodic West Nile virus transmission model with time-varying incubation periods. Apart from seasonal variations, another important feature of our environment is the spatial heterogeneity. Hence, we incorporate the movement of both vectors and hosts, temperature-dependent incubation periods, seasonal fluctuations and spatial heterogeneity into a general reaction-diffusion vector-borne disease model. By using the theory of basic reproduction number, we derive the basic reproduction number and establish a threshold-type result for the global dynamics in terms of the basic reproduction number for each model.

As biological invasions have significant impacts on ecology and human society, how the growth and spatial spread of invasive species interact with environment and affect the propagation process becomes an important and challenging problem. We first propose an impulsive integro-differential model to describe a single invading species with a birth pulse in the reproductive stage and a nonlocal dispersal stage.
Next, we study the propagation dynamics for a class of integro-difference two-species competition models in a spatially periodic habitat.