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Modeling the Growth, Invasion and Competition of Aedes Mosquitoes in Florida

The *Aedes* mosquitoes, in particular *Aedes aegypti* and *Aedes albopictus*, are the primary vectors that transmit several arboviral diseases, including chikungunya fever, dengue fever, yellow fever, and Zika. Recently, the world has been experiencing a series of major outbreaks of these vector-borne diseases (for example, the 2016 Zika outbreak in Florida, etc.). In order to study the transmission dynamics of these vector-borne diseases, it is very important and necessary to understand the population dynamics, current distributions and movements of *Aedes* mosquitoes for successful surveillance and control programs. In this talk, we will introduce some of our recent studies on modeling the population dynamics of *Aedes* mosquitoes, the invasion of *Aedes albopictus* mosquitoes, and the competition between *Aedes aegypti* and *Aedes Albopictus* mosquitoes in Florida, the United States. In particular, we propose a competition model with road-field diffusion in which the invasive population not only disperses in the interior of the spatial domain but also moves faster on the boundary of the domain. Both strong-weak and weak-weak competitions are discussed. It is shown that the asymptotic spreading speed of the wave fronts is increasing only if the road diffusion rate is greater than the field diffusion rate. Numerical simulations are presented to illustrate our analytical results and to explain the current estimated distributions of these two mosquito species in Florida.