

Applied Dynamical Systems Seminar

Ms. Xiunan Wang,
Memorial University

Tuesday, January 24, 2017
1:00p.m., HH-3013

Malaria Transmission Model with Temperature-dependent Incubation Period

Abstract:

Malaria is an infectious disease caused by Plasmodium parasites and is transmitted among humans by female Anopheles mosquitoes. Climate factors have significant impact on both mosquito life cycle and parasite development. To consider the temperature sensitivity of the extrinsic incubation period (EIP) of malaria parasites, we formulate a delay differential equations model with a periodic time delay. We derive the basic reproduction ratio R_0 and establish a threshold type result on the global dynamics in terms of R_0 , that is, the unique disease-free periodic solution is globally attractive if $R_0 < 1$; and the model system admits a unique positive periodic solution which is globally attractive if $R_0 > 1$. Numerically, we parameterize the model with data from Maputo Province, Mozambique and simulate the long term behavior of solutions. The simulation result is consistent with the obtained analytic result. In addition, we find that using the time-averaged EIP may result in underestimation of the basic reproduction ratio. This talk is based on a joint work with Prof. Xiao-Qiang Zhao.