HERMANN EBERL, University of Guelph

Chaos in the Hive and Beyond: A Multiscale Model of Nosemosis in an Apiary

Recent years have seen the emergence of many generic or specific models for the dyamics of honeybee diseases. The vast majority of these studies consider a single hive only. We present and discuss an eco-epidemiological multiscale model of the transmission of Noesemosis in an apiary. For the transmission of the disease on the apiary level, i.e between hives, we develop a mathematical model of drifting, i.e. "*the change of residence of bees from one hive to another*" (as Corkins put it in 1932). For the transmission of the disease within a colony, we consider two routes, a direct and an indirect one. This extends our previous work on Nosemosis to the metapopulation setting. It leads to a system of $5N$ nonautonouos ODEs, where N is the number of colonies considered. We explore the model numerically. The main finding is that the apiary level dynamics of the disease can be greatly different (highly irregular chaos vs periodic), depending on which of the two within-hive transmission routes dominates. This is joint work with Nasim Muhammad.