Global dynamics for spatial epidemic and population models in patchy environment with delays

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Many infectious diseases are transmitted during long distance transportation. We study a class of spatial epidemic models that includes this phenomenon, thus having a dynamics not only at geographic locations, but also during travel. The system can be formulated as an age structured PDE model, where age is the time elapsed since start of travel, but when the disease dynamics is SIS type, we can reduce it to an explicit system of delay differential equations. Using the theory of asymptotically autonomous semiflows and sublinear cooperative systems, we give a complete characterization of the global dynamics by means of various reproduction numbers and the structure of the underlying transportation network.

Second, we consider a patchy Nicholson's blowflies model with multiple delays, which are due to maturation time. This system is not cooperative, but we can show several threshold type theorems about persistence and extinction in both the irreducible and reducible cases. New results will be presented about the existence and the global attractivity of the positive equilibrium.

Joint work with Yukihiko Nakata and Teresa Faria.

References

[1] *Y. Nakata, G. Röst*: Global analysis for spread of infectious diseases via transportation networks. Submitted.

[2] *T. Faria, G. Röst*: Persistence, permanence and global stability for an n-dimensional Nicholson system. Submitted.