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Seasonal migration dynamics and finite dimensional reduction of periodic delay differential systems

This is based on joint work with Xiang-Sheng Wang. We study a patchy model of bird migration between the summer breeding ground and the winter refuge site, along a finite set of stopovers. The model involves time lags for the transition time between the patches, and the model parameters are periodic in time as the biological activities related to the migration and reproduction are seasonal. Based on a surprising observation that the delay differential system is completely characterized by a finite dimensional ODE system, we construct a finite dimensional map to capture the bird migration dynamics. As a consequence, we derive the threshold condition, explicitly in terms of the model parameters, for the extinction and persistence of the considered bird species.