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Spatial dynamics of a partially degenerate reaction-diffusion system in a periodic habitat

In this talk, I will report our recent research on a partially degenerate reaction-diffusion system in a periodic habitat, which is motivated by Lutscher, Lewis and McCauley's benthic-pelagic population model. We first obtain sufficient conditions for the existence of principal eigenvalues in the case where solution maps of the associated linear systems lack compactness, and prove a threshold type result on the global dynamics for the periodic initial value problem. Then we establish the existence and computational formulae of spreading speeds for the general initial value problem. Finally, we show that the spreading speeds are also the minimum wave speeds for the spatially periodic traveling waves (i.e., pulsating fronts) connecting the stable positive periodic steady state and the unstable trivial one. The stability of non-critical pulsating waves will also be discussed.