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Traveling waves and propagation dynamics of competitive systems in a road-field environment with climate change

In response to climate change caused largely by the industrial development of humans, lot of species may have to change their residential habitats and living habits to survive. Meanwhile, it has been well-known that networks (like roads, rivers and seismic lines etc.) have deep impacts on the spread of pandemics, invasive species, plant pathogens and so on. Motivated by the recent work of Berestycki and his research group, in this talk, we study the joint influence of a road-field diffusive system coupled with climate changes on the dynamical behaviors of two competitive populations in the case of one of which is assumed to be home territory. Viewed as one of the most important phenomena in propagation dynamics, forced traveling wave solution (TWS) is firstly investigated and we find that its existence is relevant to the values of the shift speed c which the climate changes with. When and only when $c \in (0, c^*)$ (c^* is a threshold shifting speed and its value is related to the ratio of the two diffusion coefficients–on the road and in the filed), one can establish the forced TWS for the system. Moreover, we show that the forced TWS is locally stable by using a squeezing result. Finally, to draw a complete figure of the propagation dynamics, we investigate the global spreading behaviors in the case $c \in (c^*, \infty)$. In this case, the spatial domain for the extinction of both populations are established, and can be interpreted as gap formation for the two biological species.