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Studying the evolution at the front line of emidemics

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I will talk about a system of two coupled reaction-diffusion equations modeling the spread of evolving diseases. In this scenario, a pathogen propagates within a population of susceptible hosts while a fast mutation process allows its phenotype to change in the same time scale as the invasion process. I will consider a special case where only two phenotypes exists, leading to a system of two coupled KPP-type equations.
I will first talk about the case of a homogeneous space, where the reaction coefficients do not depend on the space variable, and present a construction of traveling waves that allow us to characterize the propagation. Then, I will investigate the case of a periodically heterogeneous space, and show how we constructed pulsating fronts in this situation. In both cases, there is competition between the two pathogens, which we treated as a non-local term; in particular, we are not in a situation where a comparison principle is available, which is a challenging mathematical problem.

Références

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