

LONG TIME BEHAVIOR OF THE FIELD-ROAD DIFFUSION MODEL

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The *field-road model* was introduced by Berestycki, Roquejoffre and Rossi [3] to describe the spread of invasive species in presence of networks with fast propagation. It consists of two PDEs posed on sets of different dimensions (a *field* and a *road*) and connected through exchange terms on the road, which makes its analysis quite involved. The road may enhance the spreading of individuals and this acceleration phenomenon has since then received a lot of attention.

In this talk, we consider the *purely diffusive* field-road model as a starting point. First, in the whole space, we reach an explicit expression for both the fundamental solution and the solution to the associated Cauchy problem, thus providing a sharp (possibly up to a logarithmic term) decay rate of the L^∞ norm of the solution. Second, in a bounded domain, we study the long time convergence to the selected stationary state. We prove exponential decay of an entropy, in both the continuous and the discrete settings. The analysis requires an unconventional Poincaré-Wirtinger inequality. We propose a finite volume scheme and establish some numerical results.

The talk is based on [2] with Romain Ducasse (Univ. Paris Cité) and Samuel Tréton (Univ. Rouen Normandie), and on [1] with Claire Chainais-Hillairet (Univ. Lille, INRIA).

References

- [1] M. Alfaro and C. Chainais-Hillairet. An entropy approach for the field-road diffusion model. In preparation.
- [2] M. Alfaro, R. Ducasse, and S. Tréton. The field-road diffusion model: fundamental solution and asymptotic behavior. to appear in J. Differential Equations.
- [3] H. Berestycki, R. Jean-Michel, and L. Rossi. The influence of a line with fast diffusion on Fisher-KPP propagation. *Journal of Mathematical Biology*, 66:743–766, 2013.