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# Bistable reaction-diffusion equations and propagation properties in unbounded domains

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## Abstract

We consider a bistable reaction-diffusion equation in unbounded domains and we investigate the existence of propagation phenomena, possibly partial, in some direction or, on the contrary, of blocking phenomena. This problem is motivated by the question of propagation mechanisms in several biological systems.

We will start by describing the biological motivations behind our mathematical model. Then we will present our main results on propagation and blocking, illustrating them with biological interpretations and numerical simulations.

We start by proving the well-posedness of the problem. Then we prove that when the domain has a decreasing cross section with respect to the direction of propagation there is complete propagation. Further, we prove that a wave can be blocked as it comes to an abrupt geometry change. Finally we discuss various general geometrical properties that ensure either partial or complete invasion by 1. In particular, we show that in a domain that is “star-shaped” with respect to an axis, there is complete invasion by 1.

This a work in collaboration with Henri Berestycki and Guillemette Chapuisat.

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