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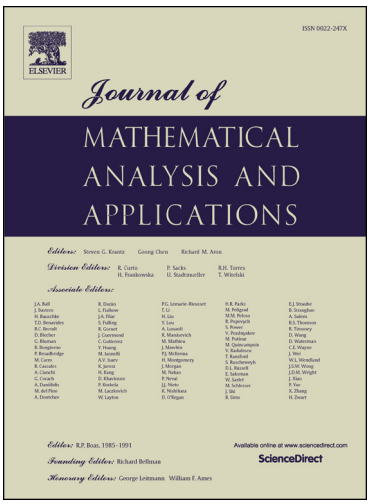

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On existence of semi-wavefronts for a non-local reaction-diffusion equation with distributed delay

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Abstract

We study the problem of existence of semi-wavefront solutions for a non-local delayed reaction-diffusion equation with monostable nonlinearity. In difference with previous works, we consider non-local interaction which can be asymmetric in space. As a consequence of this asymmetry, we must analyze the existence of expansion waves for both positive and negative speeds. In the paper, we use a framework of the general theory recently developed for a certain nonlinear convolution equation. This approach allows us to prove the wave existence for the range of admissible speeds $c \in \mathbb{R} \setminus (c_\star^-, c_\star^+)$, where the critical speeds $c_\star^-$ and $c_\star^+$ can be calculated explicitly from some associated equations. The main result is then applied to several non-local reaction-diffusion epidemic and population models.

Keywords: reaction-diffusion equation; traveling wave; non-local interaction; delay; existence.

1. Introduction.

The main object of study in this paper is the following monostable non-local reaction-diffusion equation

$$u_t(t,x) = u_{xx}(t,x) - f(u(t,x)) + \int_0^\infty \int_{\mathbb{R}} K(s,w) g(u(t-s, x-w)) dw ds. \quad (1.1)$$

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