On the stability of traveling wave solutions of the generalized convection-reaction-diffusion equations

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Abstract

The issues connected with the study of spectral stability of the kinklike and soliton-like traveling wave solutions to the generalized convectionreaction- difusion equation

 $\tau u_{tt} + u_t + \mu u u_x = \kappa \left[u^n u_x \right]_r + f(u)$

are presented. The equation of interest takes into account the effects of memory. Theorem is formulated assuring that the essential spectrum of the linearized perturbed problem does not intersect the right part of the complex plane. We also perform the discussion of the location of discrete spectrum, based on the Sturm oscillation theorem. We show that merely kink-like solutions can be stable while the soliton-like solutions are rather unstable for $\tau \geq 0$. Besides, we present the existence of three types of instabilities, leading to the destruction of the soliton-like solutions. The first type is connected with the instability of the limiting stationary solutions. Two other types are connected with the location of the discrete spectrum and are manifested in either fading or blowing-up of solutions in finite time.