On two nonlocal equations showing chaotic behaviour

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Abstract

In this talk we will introduce our results concerning a pair of nonlocal equations. The first equation is analogous to the Kuramoto-Sivashinsky equation, in which short waves are stabilized by a possibly fractional diffusion of order less than or equal to two, and long waves are destabilized by a backward fractional diffusion of lower order. The second equation is a chemotaxis model that arises related to the three-component urokinase plasminogen invasion model.

Numerical simulations show that both equations have chaotic solutions. For the nonlocal Kuramoto-Sivashinsky, the spatial structure of the solution consists of interacting traveling waves resembling viscous shock profiles. In the nonlocal model of tumor growth, the solution develop a number of peaks that emerge and, eventually, mix with other peaks.

We will present the global existence, uniqueness, and analyticity of solutions for both models. We will also show the existence of a compact attractor and an analytical bound on the number of oscillations that the solutions may develop.

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