Attractors and stability for a nonlinear convection-diffusion problem

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Abstract. A convection-diffusion problem in a half-line, arising when modeling the temperature profile of an adiabatic solid in radiation-driven combustion, is considered. Both the coefficient in the convective term (the velocity of the burning front) and the Neumann datum (the prescribed heat influx into the burning body) are nonlinearly related to the proper value of the solution at the boundary. In addition, the velocity is allowed to vanish below some threshold value (the ignition temperature). Under the assumptions of "intensely irradiated boundary" and initial data that behave suitably as $x \to -\infty$, it is proven that there exists a global attractor for the evolution semigroup associated with the problem. Furthermore, the stabilization of all solutions towards the equilibrium solution (a uniformly propagating front) is derived for a class of Neumann data, which are of some interest for applications.

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