Existence of a universal attractor for a parabolic-hyperbolic phase-field system

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We analyze a nonconserved phase-field system where the evolution of the order parameter χ is governed by a nonlinear hyperbolic equation. This feature is a consequence of the assumption that the response of χ to the generalized force which drives the system toward equilibrium states is not instantaneous but delayed. The resulting model consists of a parabolic equation for the (relative) temperature ϑ which is nonlinearly coupled with the hyperbolic equation for χ. We first show that, introducing appropriate boundary conditions, the model defines a dissipative dynamical system on a suitable phase space. Then, we prove that the dynamical system has a universal attractor. Finally, we conclude with some remarks on the comparison with the longterm behavior of the standard phase-field system.