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Convergence to Diffusion Waves for Nonlinear Evolution Equations with Ellipticity and Damping, and with Different End States

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摘要 In this paper, we consider the global existence and the asymptotic behavior of solutions to the Cauchy problem for the following nonlinear evolution equations with ellipticity and dissipative effects: $\left\{ \begin{array}{l} \psi_t - (1-\alpha)\psi - \theta_x + \alpha\psi_{xx}, \\ \theta_t = -(1-\alpha)\theta + \nu\psi_x + (\psi\theta)_x + \alpha\theta_{xx} \end{array} \right.$ with initial data $(\psi, \theta)(x, 0) = (\psi_0(x), \theta_0(x)) \rightarrow (\psi_{pm}, \theta_{pm})$ as $x \rightarrow \pm\infty$ where α and ν are positive constants such that $\alpha < 1$, $\nu < 4\alpha(1-\alpha)$. Under the assumption that $\|\psi_+ - \psi_- + |\theta_+ - \theta_-|\|$ is sufficiently small, we show the global existence of the solutions to Cauchy problem (E) and (I) if the initial data is a small perturbation. And the decay rates of the solutions with exponential rates also are obtained. The analysis is based on the energy method.

关键词 [evolution equations](#) [diffusion waves](#) [decay rate](#) [energy method](#) [a priori estimates](#)

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Convergence to Diffusion Waves for Nonlinear Evolution Equations with Ellipticity and Damping, and with Different End States

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Abstract In this paper, we consider the global existence and the asymptotic behavior of solutions to the Cauchy problem for the following nonlinear evolution equations with ellipticity and dissipative effects: $\left\{ \begin{array}{l} \psi_t - (1-\alpha)\psi - \theta_x + \alpha\psi_{xx}, \\ \theta_t = -(1-\alpha)\theta + \nu\psi_x + (\psi\theta)_x + \alpha\theta_{xx} \end{array} \right.$ with initial data $(\psi, \theta)(x, 0) = (\psi_0(x), \theta_0(x)) \rightarrow (\psi_{pm}, \theta_{pm})$ as $x \rightarrow \pm\infty$ where α and ν are positive constants such that $\alpha < 1$, $\nu < 4\alpha(1-\alpha)$. Under the assumption that $\|\psi_+ - \psi_- + |\theta_+ - \theta_-|\|$ is sufficiently small, we show the global existence of the solutions to Cauchy problem (E) and (I) if the initial data is a small perturbation. And the decay rates of the solutions with exponential rates also are obtained. The analysis is based on the energy method.

Key words [evolution equations](#) [diffusion waves](#) [decay rate](#) [energy method](#) [a priori estimates](#)

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