

Late-time relaxation limits of nonlinear hyperbolic systems. A general framework

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We investigate the late-time asymptotic behavior of solutions to nonlinear hyperbolic systems of conservation laws containing stiff source term. On one hand, we determine the relevant asymptotic expansion, derive a reduced system in the limit, and discuss the role of an entropy condition to establish the diffusive nature of the reduced system. On the other hand, we propose a new numerical scheme of finite volume type, which allows us to recover the correct asymptotic regime. The associated discrete form of the diffusion system is achieved via a suitable discretization compatible with the stiff source term. Our theoretical results are illustrated with several models from continuum physics and numerical experiments demonstrating the relevance of the proposed theory and numerical strategy.

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