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Asymptotics of radially symmetric solutions for the exterior problem of multidimensional Burgers equation. (Chinese. English summary) Zbl 1499.35105
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Summary: We are concerned with the large-time behavior of radially symmetric solutions to the exterior problem of multidimensional Burgers equation and focus on the nonlinear stability of its radially symmetric stationary waves under radially symmetric initial perturbation. For such a problem, a sufficient condition to guarantee the existence of such a stationary wave was obtained in 2019, but since the stationary wave is no longer monotonic, its nonlinear stability is justified only for the case where an additional assumption is imposed. The main purpose of this paper is to verify the time asymptotically nonlinear stability of such a stationary wave under the condition mentioned above to guarantee its existence. Moreover, we also derive the temporal convergence rates, both algebraically and exponentially, of solutions of the above exterior problem to the stationary wave. Our stability analysis is based on a space weighted energy method with a suitable chosen weight function, while for the temporal decay rates, in addition to such a space weighted energy method, we also use the space-time weighted energy method introduced by previous researchers in 1985.

MSC:
35B40 Asymptotic behavior of solutions to PDEs
35B35 Stability in context of PDEs
35Q53 KdV equations (Korteweg-de Vries equations)

Keywords:
multidimensional Burgers equation; exterior problem; radially symmetric stationary waves; nonlinear stability; space-time weighted energy method

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