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Asymptotics of radially symmetric solutions for the exterior problem of multidimensional
Burgers equation.  (Chinese. English summary) Zbl 07494978

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 sym-
metric 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 station-
ary 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. More-
over, 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
pervious 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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