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Kink Stability of Isothermal Spherical Self-Similar Flow
ANZHONG WANG, YUMEI WU, Baylor University — The problem of kink stability of isothermal spherical self-similar flow in newtonian gravity is revisited. Using distribution theory we first develop a general formula of perturbations, linear or non-linear, which consists of three sets of differential equations, one is in each side of the sonic line, and the other is along it. By solving the equations along the sonic line we find explicitly the stability criterion for the self-similar solutions. When the solutions are smoothly across the sonic line, our results reduce to those of Ori and Piran. To show such obtained perturbations can be matched to the ones in other regions, we study the linear perturbations outside of the sonic line, by taking the solutions obtained along the line as the boundary conditions. After properly imposing other boundary conditions in the space, we are able to show that linear perturbations outside the sonic line, satisfying all the boundary conditions, exist for any given k, where k denotes the spectrum of the perturbations obtained along the sonic line. As a result, the complete treatment of perturbations in the whole space does not alter the spectrum obtained by considering only the perturbations along the sonic line.

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