Anelastic Approximation of the Gross-Pitaevskii equation for General Initial Data

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Abstract

We perform a rigorous analysis of the anelastic approximation for the Gross-Pitaevskii equation with $x$-dependent chemical potential. For general initial data and periodic boundary condition, we show that as the Planck constant tends to zero, the density converges toward the chemical potential and the velocity field converges to the anelastic system. When the chemical potential is a constant, the anelastic system will reduce to the incompressible Euler equations. The resonant effects the singular limit process and it can be overcome because of oscillation-cancellation.