

The Oberbeck-Boussinesq approximation in R^3 as a limit of compressible Naver-Stokes-Fourier with low Mach number

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We study the asymptotic limit of solutions to the compressible Navier-Stokes-Fourier system, when the Mach number is small proportional to ϵ , Froud number is proportional to $\sqrt{\epsilon}$ and $\epsilon \rightarrow 0$. The domain containing the fluid varies with changing parameter ϵ . The fluid is driven by gravitation generated by object(s) placed in fluid of diameter converging to zero. As $\epsilon \rightarrow 0$, it is shown that the fluid velocity converges to a solenoidal vector field satisfying the Oberbeck-Boussinesq approximation on R^3 space with concentric gravitation force. The proof is based on spectral analysis of the associated wave propagator (Neumann Laplacian) governing the motion of acoustic waves.

References

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