

Abstract Submitted
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Extension of Basset-Boussinesq-Oseen and Maxey-Riley Equations to Compressible Flows MANOJ PARMAR, ANDREAS HASELBACHER, S. BALACHANDAR, University of Florida — Viscous compressible flow around a sphere is considered in the limit of vanishing Reynolds and Mach numbers. Using the analytical solution derived in earlier works, an exact expression for the transient force on a sphere undergoing arbitrary motion with the inclusion of compressibility effects is presented. The transient force is decomposed into quasi-steady, inviscid unsteady, and viscous unsteady components. The influence of compressibility on each of these components is examined. Numerical results for the transient force are in excellent agreement with theory. The present formulation thus offers an explicit expression for the unsteady force in the time domain and can be considered as a generalization of the Basset-Boussinesq-Oseen equation to the compressible flow regime that can be used in numerical simulations of compressible multiphase flows. An extension of Maxey-Riley equation for particle motion in non-homogeneous compressible flows is also proposed.

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