Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Unsteady Forces on Particles in Viscous Compressible Flow[1]
MANOJ PARMAR, ANDREAS HASELBACHER, S. BALACHANDAR, University of Florida — The primary objective of our work is the study of unsteady forces on particles in compressible flow. In incompressible flow, unsteady inviscid and viscous forces arise from the no-penetration and no-slip conditions on the surface of a particle. In prior work, building on results by Miles and Longhorn, we have investigated the unsteady force on particles in inviscid compressible flow at finite Mach numbers. The results indicate that the unsteady force can become about twice as large as the incompressible value even for subcritical Mach numbers. The contributions of this work are twofold. First, based on the kernel for the unsteady inviscid force in compressible flow, we present a simple model for the unsteady force on particles arising from shock-wave impact, and assess it by comparison with experimental and computational results. Second, we construct a unified model based on an unified kernel for the unsteady inviscid and viscous forces in compressible flow.

[1]The authors gratefully acknowledge support by the National Science Foundation through grant number EAR0609712.

Andreas Haselbacher
University of Florida

Date submitted: 31 Jul 2008 Electronic form version 1.4