Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

A low-Mach approximation computational framework for particle-laden flows subject to radiation HADI POURANSARI, Department of Mechanical Engineering, Stanford University, REMI ZAMANSKY, Center for Turbulence Research, ALI MANI, Department of Mechanical Engineering, Stanford University — The three-way coupled physics of radiation, fluid flow, and particle transport forms the dynamical ingredients in various technological and natural systems, such as particle-based solar-thermal systems, clouds, soothing flames, and atmospheric aerosols. Depending on radiation intensity, the density fluctuations in such systems can be up to order of the mean density itself. We present a parameterization of this problem using a simple model considering flow laden with particles with finite momentum relaxation time. We further present a coupled computational algorithm for simulation of flow, particle transport, and heat transfer using low-Mach approximation. Variety of statistics for gas and dispersed phases are investigated to depict the effect of radiation on particle-laden turbulence at different scenarios. The range of applicability of Boussinesq approximation for modeling buoyancy effects will be discussed.

Hadi Pouransari
Department of Mechanical Engineering, Stanford University

Date submitted: 02 Aug 2013 Electronic form version 1.4