Fluctuations in number and volume fraction in granular and multiphase flows: implications for theory and modeling SHANKAR SUBRAMANIAM, Department of Mechanical Engineering, Iowa State University — Fluctuations in the number of particles, and consequently the fraction of volume occupied by them, are observed in experiments as well as simulations of granular and multiphase flows. The mathematical representation of these fluctuations is described, and compared with the standard average number density representation in kinetic theory of granular and gas-solid flow. Implications for the strong and weak forms of the conservation laws of hydrodynamic quantities are discussed, and this leads to possible approaches to model the effect of fluctuations. The manifestation of fluctuations in current closure models is examined using data from direct numerical simulation. Implications for the stability analysis of gas-solid flows, and the stability limits calculated from reduced statistical representations are discussed.

Shankar Subramaniam
Department of Mechanical Engineering, Iowa State University

Date submitted: 08 Aug 2009   Electronic form version 1.4