1027-76-227 **Alan L. Graham** (graham@lanl.gov), Los Alamos National Laboratory, Los Alamos, NM 87545, and **Marc Ingber** (ingber@me.unm.edu), **Marina Popova** (mpopova@unm.edu) and **Peter Vorobieff*** (kalmoth@unm.edu), The University of New Mexico, Department of Mechanical Engineering, Albuquerque, NM 87131. *Irreversibility and chaos in shear flow carrying particles.*

At very low Reynolds numbers where the hydrodynamics of single-phase fluid flows can be described by Stokes equations (and thus the flow is time-reversible), introduction of a second phase (particles) into the flow is known to produce irreversibility. There is some argument in the literature regarding the mechanism of this irreversibility and the minimum number of interacting particles necessary to trigger it. Our experimental study investigates the interaction of pairs and triplets of nearly spherical solid particles suspended in a quasi-two-dimensional stratified shear flow. The surfaces of the particles are well characterized, with roughness maps produced by a scanning electron microscope. We measure the degree of irreversibility introduced into the flow by particle interactions. We find that both two- and three- particle interactions are irreversible, with the macroscopic irreversibility of the two-particle interaction attributable to subtle microscale surface features (roughness), with greater irreversibility reliably correlated with rougher particle surfaces. At the same time, interactions within particle triplets show a highly chaotic behavior distinguishably different from that of the two-particle systems. (Received February 27, 2007)