

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Velocity correlations in dense granular flows observed with internal imaging¹ ARSHAD KUDROLLI, ASHISH ORPE, Clark University — We measure the velocity fluctuations in uniform dense granular flows inside a silo using a fluorescent refractive index matched interstitial fluid. The measurements are made in the uniform plug flow region where the flow is dominated by grains in enduring contacts and fluctuations scale with the distance traveled, independent of flow rate. The distributions of the horizontal and vertical displacements for short time scales show fat tails compared to a Gaussian indicating large fluctuations in particle displacements and possible cage breaking. The mean square displacements show an inflection point supporting the presence of caging dynamics. The velocity autocorrelation function of the grains in the bulk shows a negative correlation at short time and slow oscillatory decay to zero similar to simple dense liquids. Weak spatial velocity correlations are observed in the bulk over several grain diameters. The observed correlations are qualitatively different at the boundaries where significant structural ordering in the flowing granular layer is observed.

¹Supported by the National Science Foundation under grant number CTS-0334587, and by the donors of the Petroleum Research Fund.

Arshad Kudrolli
Clark University

Date submitted: 17 Nov 2006

Electronic form version 1.4