Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

3D imaging of particle-scale rotational motion in granular flows

MATT HARRINGTON, MICHAEL LIN, WOLFGANG LOSERT, University of Maryland — In current granular research, many strides have been made in the characterization of three-dimensional motion and structure through the use of novel imaging techniques. In the context of measuring individual motion of spherical grains, these techniques tend to be limited to translational motion. While this is often sufficient, it neglects the rotational motion that can arise from torques that grains exert on each other, and that potentially propagate across mesoscopic structures. This has left a gap that prevents researchers from fully characterizing the behavior of real granular flows. In particular, the role of individual rotational motion has not been fully explored in the context of bulk processes such as shear-banding, segregation, and irreversibility. In our current work, the Refractive Index Matched Scanning technique is expanded to extract the orientation of near-spherical grains in a quasistatic shear flow. Particle tracking is then applied to directly measure the rotational motion of individual grains. In an initial study, the presence of rolling modes in the shear band of a circular shear cell has been confirmed. From here, we are extending the method further to determine the role of collective rotations within and across neighborhoods.

Matt Harrington
University of Maryland

Date submitted: 12 Nov 2014

Electronic form version 1.4