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Investigation of structure and dynamics of gravity driven dense granular flows with internal imaging[1] ASHISH ORPE, ARSHAD KUDROLLI, Department of Physics, Clark U., Worcester, MA 01610 — We investigate the dynamics of dense granular flows during the drainage of a 3-dimensional silo with a rectangular cross-section. The silo is filled with glass particles, and a liquid with the same refractive index to visualize the grains away from the side walls. A plane of grains is illuminated using a laser, and dark particles against a fluorescent background are imaged using a digital camera. The particle positions are identified and tracked over long durations to obtain flow characteristics such as mean squared displacements, velocity correlations and cage correlation functions. A hexagonal close packing is obtained near the walls while a random packing is obtained inside the silo. The flow region is plug like high above the orifice and becomes parabolic as it approaches the orifice. In the region spanning 5 particle diameters from the orifice, the velocity profile at a constant height across the cell is non-Gaussian. The distributions of the horizontal and vertical displacements for very short time scales show fat tails compared to a Gaussian indicating large fluctuations in particle displacements and possible cage breaking. The preliminary results show absence of any spatial velocity correlations. The experimental results reveal a systematic effect of the side walls on the flow properties up to depths of 20 particle diameters.

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Ashish Orpe

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