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**Fluctuations and Response in a Dense Granular Flow**[1]
KEVIN FACTO, THOMAS SCHICKER, NARAYANAN MENON, University of Massachusetts-Amherst — We have performed experiments to determine the spectrum of fluctuations of various dynamical degrees of freedom in a dense granular flow. The measurements are made at the boundary of a 3-dimensional flow of smooth, slightly-polydisperse glass beads (d approx 1 mm) contained in a vertical channel of rectangular cross section (approx 210d x 40d x 760d). The flow velocity is controlled by a sieve of continuously variable mesh at the bottom of the channel. In the steady-state of the flow, we measure temporal fluctuations of all three components of force and torque, averaged over an area of 5 d $^2$. We are thus able to measure all 6 components of the stress tensor over a frequency range of 10Hz to 10kHz. We also present measurements of the response to sinusoidal forcing normal to the flow direction in order to determine whether the spectrum of the fluctuations determine the frequency dependence of the response, via a fluctuation-dissipation theorem.

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