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WITHDRAWN: Force fluctuations in a 3-dimensional, dense, granular flow EFROSYNI SEITARIDOU, ELLEN KEENE, NALINI EASWAR, Smith College, NARAYANAN MENON, University of Massachusetts — We have made measurements of the force normal to the wall of a 3-dimensional, gravity-driven, granular flow down a vertical cylindrical pipe. The force measurements were made at four locations, each over an area comparable to the size of a grain. The flow velocity is controlled by varying the size of the outlet at the bottom of the pipe. As the outlet is constricted, we monitor the continuous evolution in the mechanism of momentum transfer to the wall from short-lived, collisional interactions to enduring, frictional contacts. As in static granular media, and in some slow granular flows, the distributions of forces are broad, however, unlike previously studied situations, the distributions are not always exponential. We also report on the spatial and temporal correlations in the force and velocity in order to test the robustness of the observation in 2-dimensional flows that the jamming of the flow is due to transient force-bearing structures that span the flow.

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