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Experimental investigation of state variables in a dense granular layer

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Stationary states in dense granular systems lack a predictive statistical description, as kinetic theory approaches fail when the interactions significantly deviate from binary collisions. In particular, because of the degeneracy of geometric states due to friction forces, it has been argued that a comprehensive theory of such dense granular systems must incorporate additional state variables associated with constraint fluctuations. We investigate the relevance of various ensembles in a dense mixture of disks laid on a horizontal air table and driven into steady states by random kicks at the boundaries. We study how microscopically defined intensive parameters affect the macroscopic response of the system, and clarify the equilibration properties of these parameters. In collaboration with Karen Daniels, North Carolina State University.