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The stress profile in a sheared granular column[1] PRABHU NOTT, Indian Institute of Science, VISHWAJEET MEHANDIA, Universite de Strasbourg, KAMALA JYOTSNA GUTAM, Dr. Reddy's Laboratories — It has been known for several centuries that the normal stress at the base of a column of granular material deviates from the value dictated by the hydrostatic balance. This was explained by Janssen (1895) as being due to the shear stress imposed by the confining walls on the granular column, as a result of grain-wall friction. The question we address in this presentation is, what is the stress field when the column is sheared? Depending on the assumptions on the kinematics, plasticity theories predict that the stress profile is similar either to that in a static column, or to that in a sheared fluid column. Here, we report the results of our experimental study of slow shear of a granular material in a cylindrical Couette cell, in which all components of the stress were measured at the stationary outer cylinder. The stress was measured as a function of distance from the free surface. The results of our experiments are intriguing: the radial normal stress deviates strongly from the predictions of all available theories and previous experimental measurements. The axial shear stress changes sign when a static column is sheared. We describe these results, and speculate as to which type of theory might explain the observations.

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