Abstract Submitted
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Velocity Depth Profile of Granular Media in a Horizontal Rotating Drum[1] LORI SANFRATELLO, University of New Mexico, ARVIND CAPRIHAN, EIICHI FUKUSHIMA, New Mexico Resonance, CHRISTIAN HEINE, RWTH-Aachen — We report on the velocity depth profile of granular materials within the lens-shaped flowing region of a horizontal rotating drum. Using MRI velocimetry, we found that the velocity profile of the flowing layer near the axial center of a half-filled 3D drum has the form Vm[1-(r/r0)ˆ2]-Ωr, where r is the depth measured from the cylinder center, except very close to the free surface where it lies below the quadratic form. We propose that this deviation is due in part to particles reaching the surface with components of their velocity in the azimuthal direction. To test this we used a 3D cylinder with a radial "paddle" placed approximately at the dynamic angle of repose, covering the top 1/4 of the flow, so as to direct the particles immediately into the flow upon reaching the surface. Data taken with the paddle at the free surface fit the quadratic better than without the paddle at all rotation rates observed. Thus, we conclude that the quadratic form is intrinsic to this flow geometry.

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