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Dense free surface flow in granular mixtures J. ZHANG, K.M. HILL, Department of Theoretical and Applied Mechanics, University of Illinois, Urbana, IL — When the surface of a sandpile is tipped beyond the angle of repose, the particles will start to flow, but only in a thin surficial boundary layer. The flow of monodisperse spherical particles is laminar-like, with the particles moving primarily in layers parallel to the free surface. This laminar structure has been recently shown to determine certain details of the volume fraction and particle velocities. Further, a simple "slip and shake" model based on the laminar structure has been shown to describe well the nature of the diffusion and the velocity fluctuations. We test the applicability of these results for a broader range of granular systems, specifically, for mixtures of particles. As is typically observed, smaller (or, alternatively, denser) particles segregate to the bottom of the boundary layer; measurements are taken before, during, and after segregation. We find a similar stratified structure in these mixtures, though the structure is less distinct in the pre-segregated state for the different sized particles. Nevertheless, we find the laminar structure has similar significance for kinematic details in granular mixtures at every stage of segregation.

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