Abstract Submitted
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Dense Inclined Flows of Spheres JAMES JENKINS, Cornell University — We operate in the context of a slightly modified hydrodynamic theory for frictionless spheres and consider deep, dense flows down a bumpy incline. The modification is the introduction of a length other than the diameter in the expression for the rate of collisional dissipation. The idea is that the first influence of the formation of particle chains is felt by the rate of dissipation. The chain length is determined by a simple algebraic balance between the creation and destruction of chains. The resulting theory is used together with the boundary conditions at a bumpy base and a free surface to determine the profiles of volume fraction, mean velocity, and fluctuation energy for steady, fully-developed flows of identical spheres. The profiles exhibit the features seen in numerical simulations. The integration of the energy balance through the depth of the flow result in an improvement of a velocity scaling often employed in the interpretation of physical experiments.

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