Abstract Submitted
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Discrete particle modelling of granular roll waves[1] JONATHAN TSANG, STUART DALZIEL, NATHALIE VRIEND, University of Cambridge — A granular current flowing down an inclined chute or plane can undergo an instability that leads to the formation of surface waves, known as roll waves. Examples of roll waves are found in avalanches and debris flows in landslides, and in many industrial processes. Although related to the Kapitza instability of viscous fluid films, granular roll waves are not yet as well understood. Laboratory experiments typically measure the surface height and velocity of a current as functions of position and time, but they do not give insight into the processes below the surface: in particular, the possible formation of a boundary layer at the free surface as well as the base. To overcome this, we are running discrete particle model (DPM) simulations. Simulations are validated against our laboratory experiments, but they also allow us to examine a much larger range of parameters, such as material properties, chute geometry and particle size dispersity, than that which is possible in the lab. We shall present results from simulations in which we vary particle size and dispersity, and examine the implications on roll wave formation and propagation. Future work will include simulations in which the shape of the chute is varied, both cross-sectionally and in the downstream direction.

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