Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Multiple Solutions of Rapid Granular Chute Flow MARK WOODHOUSE, ANDREW HOGG, School of Mathematics, University of Bristol — The free-surface flow of highly agitated particles on an inclined chute is analysed using a continuum model that adopts the kinetic theory of rapid granular flows. Steady, fully developed profiles for the volume fraction, velocity and granular temperature of the flowing grains may be found as solutions to the governing equations. These are calculated using a pseudospectral method that exploits the asymptotic form of the solutions at large heights. The character of the steady solutions is determined by a relatively small number of dimensionless parameters, which includes the slope inclination and material properties of the grains. The pseudospectral approximation lends itself to parametric continuation, which allows us to efficiently track the form of the solutions as we vary the controlling parameters. In particular, we investigate the depth of steady flows, here defined as the centre of mass, as the volume flux of material is varied and find that, in some parameter regimes, three flow depths occur for a given volume flux of material. For such flows, we consider the linear stability of the multiple solutions to small perturbations.

Mark Woodhouse
School of Mathematics, University of Bristol

Date submitted: 05 Aug 2006 Electronic form version 1.4