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Flow and packing properties of frictional shapes from spheres to cubes LEONARDO E. SILBERT, Southern Illinois University, K. MICHAEL SALERNO, DAN S. BOLINTINEANU, JEREMY B. LECHMAN, GARY GREST, Sandia National Laboratories — Though grains in many applications are aspherical and rough, many computational studies of granular flow and packing focus on ideal spherical particles, often without friction. Following Latham [1], we optimally represent arbitrary shapes using overlapping spheres of different sizes. We use discrete element simulations to study the packing and flow of frictional granular superquadric (superball) shapes ranging from spheres to cuboids. When packing particles, friction becomes more important as particle shape becomes more angular. This leads to a larger density change between frictional and frictionless packings. Friction and shape are also important to granular flow. For a planar-shear flow different shapes have similar flow behavior in the zero-friction limit. However, with increasing friction particle shape couples to the tangential frictional forces and becomes more important. Flow results are compared with continuum theories of granular materials. Results from simulations of anisotropic particles and mixtures of shapes will also be discussed.

[1] X. Garcia, J. Xiang, J.-P. Latham, and J. P. Harrison, Géotechnique 59, 779 (2009).

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