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Granular dynamics vs. fluid dynamics: similarities and differences MILAD RAKHSHA, CONLAIN KELLY, NICHOLAS OLSEN, DAN NEGRUT, University of Wisconsin - Madison — In understanding the dynamics of granular systems, discrete modeling of granular flows requires tracking particles whose motion is by and large shaped by frictional contact forces. Such an approach is challenged when the particle size is small, e.g., sub millimeter, and/or when the number of particles is large, e.g., one billion particles and beyond. In these cases, one can contemplate switching to continuum models for granular dynamics. Inspired by the fluid-like behavior of granular material, in this contribution we report on an approach in which granular material dynamics is approximated via a fluid flow. The results reported draw on computer simulations using the Discrete Element Method (DEM) to solve the Newton-Euler equations of motion. For the fluid flow, we employ the Smoothed Particle Hydrodynamics (SPH) to solve the Navier-Stokes equations. Similarities and differences between the discrete, fully resolved model and the continuum granular material model are reported drawing on a set of three numerical experiments: compressibility test, the classical dam break problem, and the dam break simulation with an obstacle.

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