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Simulation of granular flows through their many phases SACHITH DUNATUNGA, Massachusetts Inst of Tech-MIT — The material point method (MPM) is combined with a constitutive model which allows material to traverse through its many common phases during the flow process. When dense, the material is treated as a pressure sensitive elasto-viscoplastic solid obeying a yield criterion and a plastic flow rule given by the $\mu(I)$ inertial rheology of granular materials. When the free volume exceeds a critical level, the material is deemed to separate and is treated as disconnected, stress-free media. By using the MPM framework, extremely large strains and nonlinear deformations such as those common to granular flows can be represented. The method has been shown to replicate results such as Beveloo scaling in silo discharge, as well as the Bagnold profile on an inclined plane.

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