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Effects of microscale rolling friction on dense virtual particle assemblies

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ABSTRACT

Discrete element method (DEM) is helpful in determining how microscale particle roughness and shape affect the mechanical behavior of dense particle assemblies. Researchers have found analogs between microscale rolling friction and the effects of surface roughness and particle shape. Although rolling friction effects have been studied thoroughly in loose granular flows, there is a need to understand the global effects of microscale rolling friction on dense particle assemblies. This article investigates the effects of rolling friction on various mechanical responses of virtual particle assemblies in simulated triaxial and oedometer tests. Several tests were simulated while broadly varying rolling friction. Global-scale stress-strain and volume change responses are captured and analyzed. Results can be used to simplify and speed DEM models by exchanging computationally heavy particle shapes for more efficient rolling friction formulations.