Abstract Submitted
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A square-force cohesion model and its extraction from bulk measurements[1] PEIYUAN LIU, CASEY LAMARCHE, KEVIN KELLOGG, CHRISTINE HRENYA, Department of Chemical and Biological Engineering, University of Colorado Boulder, Boulder, CO 80309, USA — Cohesive particles remain poorly understood, with order of magnitude differences exhibited for prior, physical predictions of agglomerate size. A major obstacle lies in the absence of robust models of particle-particle cohesion, thereby precluding accurate prediction of the behavior of cohesive particles. Rigorous cohesion models commonly contain parameters related to surface roughness, to which cohesion shows extreme sensitivity. However, both roughness measurement and its distillation into these model parameters are challenging. Accordingly, we propose a "square-force" model, where cohesive force remains constant until a cut-off separation. Via DEM simulations, we demonstrate validity of the square-force model as surrogate of more rigorous models, when its two parameters are selected to match the two key quantities governing dense and dilute granular flows, namely maximum cohesive force and critical cohesive energy, respectively. Perhaps more importantly, we establish a method to extract the parameters in the square-force model via defluidization, due to its ability to isolate the effects of the two parameters. Thus, instead of relying on complicated scans of individual grains, determination of particle-particle cohesion from simple bulk measurements becomes feasible.

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