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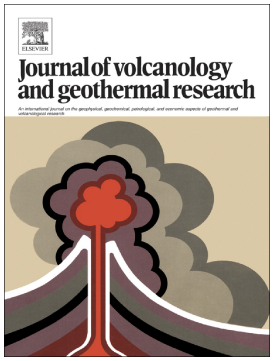

Stresses at the base of dry and dense flows of angular rock fragments in 3-D discrete element modeling: Scaling of basal stress fluctuations versus grain size, flow volume and channel width

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Stresses at the base of dry and dense flows of angular rock fragments in 3-D discrete element modeling: Scaling of basal stress fluctuations versus grain size, flow volume and channel width

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ABSTRACT

We simulate granular flows of angular rock fragments by means of a three-dimensional discrete element modeling to study the basal stresses that these flows exert on the subsurface. These granular flows have different grain sizes and different flow volumes and they model dry rock avalanches and pyroclastic flows. These flows travel on four different concave–upward chutes that represent channels on a mountainside or on the flank of a volcano. Each chute has a different width. The stress data demonstrate the validity of a linear relation between two scaling parameters: D and ψ. Parameter D is a scaled basal stress deviation that is equivalent to a scaled particle agitation. Particle agitation is ultimately responsible for the energy dissipation that governs the mobility of geophysical flows in nature. Parameter ψ contains grain size, flow volume and channel width. This second parameter is equal to the product of the reciprocal of characteristic

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