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(G*) Effective friction in aggregates of frictionless particles

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Collective properties of granular materials are determined by both interparticle forces and packing fraction. The conical shape of piles of granular material, like a pile of sand is dependant on the interparticle friction and is characterized by the angle of repose of the pile. Surprisingly, we observe formation of conical piles for aggregates of frictionless particles. Our model system is composed of monodisperse oil droplets that are frictionless but cohesive. Previous studies on this system have shown that aggregation of the droplets against an unbounded barrier resembles a liquid puddle rather than a sand pile: rather than growing taller as more droplets are added to the aggregate, a characteristic height is reached after which the aggregate just spreads. In contrast, when the barrier is bounded, we see that the aggregate exhibits a conical growth pattern reminiscent of sand piles. We systematically measure the angle of repose across varying cohesion strengths and droplet sizes and present a theory that explains our findings.

Keyword-1

Granular material

Keyword-2

Material stability

Keyword-3

cohesive matter

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