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(G*) Dynamic properties of a 2D granular analogue of a liquid puddle predicted through a 'granular capillary length'

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The structure of an accumulation of granular material, such as a pile of sand, can be characterized by the angle of repose, which is dependent on the balance between gravity and inter-grain friction. In contrast, for the case of a continuum material like a simple liquid, the height of a puddle is dictated by the capillary length which balances gravity and surface tension. Here we present an experiment of a 2D pile of monodisperse microscopic oil droplets. The droplets are buoyant, adhesive, and friction is negligible. Oil droplets are deposited within a chamber and accumulate at a barrier under the influence of buoyancy. In our experiments, the structure of the pile determined by a balance between buoyant and adhesive forces, reminiscent of the spreading of a liquid puddle, even though the pile is granular and 2D in nature. We define a parameter that can describe the structure of the piles, the 'granular capillary length', analogous to the capillary length in liquids. Additionally, as droplets are being added to the pile, collapsing events occur which spread the material across the barrier. The frequency of the collapses is a function of the defined granular capillary length.

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