Role of cohesion on granular motion in a rotating drum

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We present experiments on a cohesive granular material in a rotating drum. The data provide evidence of the crucial role played by the drum geometry - particularly the lateral walls - on the dynamics of the material, with the potential emergence of finite-size effects.
First, we discuss the existence of distinct motion regimes, ranging from intermittent avalanches to continuous flow, accompanied by a transition from a concave to a convex material surface. Second, we show how avalanche dynamics is fundamentally influenced by both the intensity of cohesion and the drum geometry. Finally, two dimensionless characteristic lengths are introduced, defined as the ratio of the drum dimensions to a cohesive length. These lengths will help rationalize the experimental observations and offer a phenomenological yet physically sound interpretation of the variations in surface morphology, transitions between flow regimes, and avalanche dynamics.