

Linking bottleneck clogging with flow kinematics in granular materials: The role of silo width

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Abstract

We demonstrate experimentally that clogging in a silo correlates with some features of the particle velocities in the outlet proximities. This finding, that links the formation of clogs with a kinematic property of the system, is obtained by looking at the effect that the position of the lateral walls of the silo has on the flow and clogging behavior. Surprisingly, the avalanche size depends nonmonotonically on the distance of the outlet from the lateral walls. Apart from evidencing the relevance of a parameter that has been traditionally overlooked in bottleneck flow, this nonmonotonicity supposes a benchmark with which to explore the correlation of clogging probability with different variables within the system. Among these, we find that the velocity of the particles above the outlet and their fluctuations seem to be behind the nonmonotonicity in the avalanche size versus wall distance curve.

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