Clogging Transition in a Tilted Silo

CHARLES THOMAS, DOUGLAS DURIAN, University of Pennsylvania — Granular media flow freely from large horizontal holes at the bottom of a container. However, if the hole is too small, or tilted too far from horizontal, a clog will eventually form at the exit and halt the flow. The number of beads which exit before a clog forms follows an exponential distribution. The average of this distribution increases with increasing hole size and with decreasing angle from horizontal, diverging above a critical hole size. We measure these hole sizes at different angles. The critical hole size as a function of angle constitutes the system’s phase transition on a clogging phase diagram. In comparison, the hole sizes where the Beverloo equation predicts the flux to vanish are less than half these critical hole sizes.