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**Onset of silo collapse under gravity-driven granular discharges** CLAUDIA COLONNELLO, GUSTAVO GUTIÉRREZ, LEONARDO REYES, Universidad Simon Bolivar, Caracas, Venezuela, FABIAN BRAU, Nonlinear Physical Chemistry Unit, Université Libre de Bruxelles, Brussels, Belgium, ERIC CLÉMENT, PMMH, ESPCI, CNRS (UMR 7636) and Univ. Paris 6 & Paris 7, Paris, France — Thin walled silos exhibit a critical filling height, $L_c$, above which the lateral wall buckles as a consequence of the frictional forces exerted by the grains during the granular discharge, producing a catastrophic failure of the structure. We use laboratory scale silos made of paper to study this process experimentally. Based on the observation of the deformation pattern that develops on the silo wall during the discharge, we have proposed a criterion for determining the time of onset of collapse, allowing us to study the conditions under which the collapse is triggered. In particular, we study the behavior of the grains in contact with the wall during the time interval before failure occurs and find that, according to this criterion, the collapse is triggered before a maximal mobilization of the grain-to-wall effective friction force is reached. This can be related to a theoretical model which treats the silo as a thin cylindrical shell subjected to an axial stress with the profile predicted by Janssen's model for the stresses in a silo filled with a granular material. This model predicts correctly the experimental scaling of $L_c$ with various parameters of the system.

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