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# Axisymmetric granular collapse: underlying invariance of granular dynamic ?

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Granular matter received an increasing interest over the last decade. Many scientific investigations were successfully addressed to acknowledge the ubiquitous behavior of granular matter. We currently investigate liquid impacts onto granular beds, i.e. the influence of the packing and compaction-dilation transition. However, a physically-based model is still lacking to address complex microscopic features of granular bed response during liquid impacts such as compaction-dilation transition or granular bed uplifts. Toward this numerical milestone, we first need to address a widely common dynamic granular problem to evaluate our developped 2D numerical modeling of monodisperse or polydisperse granular systems.
As aforementioned, we developped our own 2D numerical modeling based on the Distinct Element Method (DEM) using non-linear contact force laws (Hertz-Mindlin model) for disk-shape particles. The algorithm is written in C programming language.
Inspired by the work of Warnett et al. (2014) and Staron & Hinch (2005), we numerically investigated the axisymetric collapse of granular columns. We addressed the scaling between the initial aspect ratio and the final runout distance of the granular column. Our numerical results are in good aggreement when compared to the previous studies of Warnett et al. (2014) and Staron & Hinch (2005). In addition, we proposed two alternative empirical scalings based on i) the pseudo-static behavior of a sand heap and ii) the energy line dynamics assumption. We noticed both numerical and experimentat results emanating either from our numerical simulations or past studies were ranging in between these two mathematical expressions, thus delimiting minimum and maximum possible variations during the granularcollapse. When comparing results from past investigations, we also noticed similarities whatever respective physical properties. This may suggest a general behavior of granular collapses, thus indacting a sort of physical invariance when regarding the general dynamic of such phenomena.