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Experimental and numerical study of the effect of rolling friction for sandpile formation

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Discrete element simulations were carried out and compared with sandpile formation experiments on glass beads. An experimental device similar to that used by Li and al. [1] for the study of quasi-two-dimensional (Q2D) granular flow has been developed. This device consists of two boxes of plexiglas. The smaller one, put at the inner place, has three optional outlets allowing glass beads to be discharged in the larger one. This device allows the repose angle, the discharged profiles and the remaining balls to be characterized during the test and at the final stage.

For the discrete element simulations, we have used the smooth DEM [2] approach with an in-house parallelized code. In particular, the interactions between particles are modeled by elastic contact mechanics laws used classically for non-adhesive spheres (Hertz-Mindlin) [3][4][5]. Rolling friction model, described here in terms of the torque, are also implemented to counteract the rotation of particles. Discharging DEM simulations have been carried out for several diameters of particles.

Comparison of experimental and numerical results shows a good agreement when rolling friction is taken into account confirming the validity of the implementation. Thus, the rolling friction and the diameter of spheres have a clear effect of the discharged profile of sandpile of glass beads.

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