



## Modeling particle impacts on granular media for the analysis of aeolian saltation

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Grain transport by saltation is involved in numerous geophysical phenomena such as wind-blown sand, snow drift, aeolian soil erosion, dust emission, etc. Particle impacts on a granular bed trigger rebound and ejections processes, which can lead in certain conditions to a steady state of solid transport. The present work is dedicated to the analysis of the impact processes at the grain scale, with the objectives of inferring robust statistical laws and better understanding granular transport, accounting for the possible role played by adhesion between the grains.

The study is based on numerical simulations with the DEM (Discrete Element Method). The numerical experiments consist in throwing a spherical particle on a granular packing with controlled velocity (Froude number between 0 and 200) and impact angle (between 10° and 90°). The contact model (friction, cohesion) between the grains is varied to represent different types of granular materials (e.g., dry sand, wet sand, snow).

We investigated the influence of incident parameters on the impact process, focusing on the incident particle rebound and on the number and velocities of ejected particles. For non-cohesive granular beds, the simulations were compared to laboratory experiments of impacts of spherical particles on granular packings in order to validate the model. In particular, the restitution coefficient of the incident particles and the number of ejected particles were found in good agreement with experimental results. The simulations also give access to quantities that cannot be easily measured in the experiments. Hence, we could observe an anisotropy of ejected particles velocities for grazing impact angles, which is more pronounced when the incident velocity decreases.

Preliminary results concerning cohesive granular beds will also be presented, considering contact laws representative of liquid (capillary) and solid cohesion processes. Effect of cohesion on the number of ejected particles, and energy dissipation processes within the cohesive granular beds, will be discussed.