

Behaviors of Lunar Regolith Simulant Under Varying Gravitational Conditions

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Granular Behavior is Highly Variable



Barale, L. *Int J Earth* (2015).



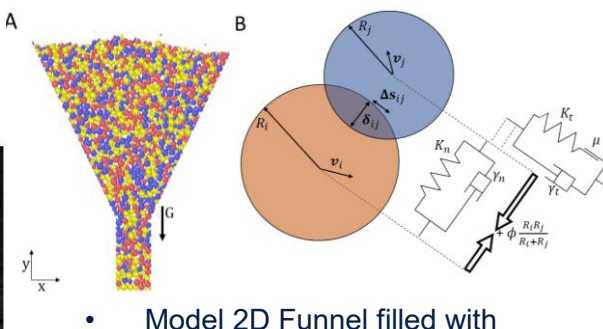
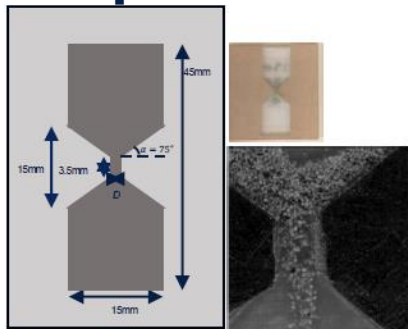
OSIRIS-Rex (Oct. 2020):
NASA/Goddard/University
of Arizona



Forterre, Y. Flows of dense granular media. *Annu. Rev. FluidMech* (2008)

- Variability in part caused by the transition from static to dynamic behavior
- How does this transition from static to dynamic depend on material composition and gravity?

Experiment / simulation model

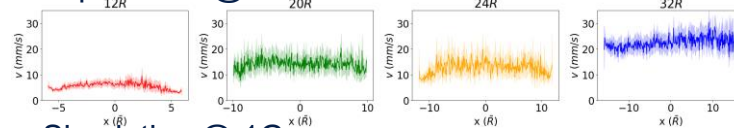


- Pseudo-2D hour-glass filled with JSC-1A regolith simulant
- Hour-glass is flipped on earth and flows are recorded

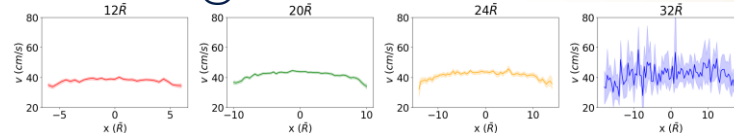
- Model 2D Funnel filled with a monolayer of polydisperse spheres (A)
- Spheres interact via DMT (variable cohesion - ϕ) model (B)
- Funnel is unplugged and grains flow out

Calibrate model by comparison

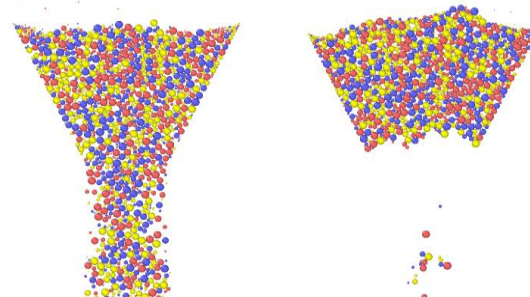
Experiment @ 1G



Simulation @ 1G



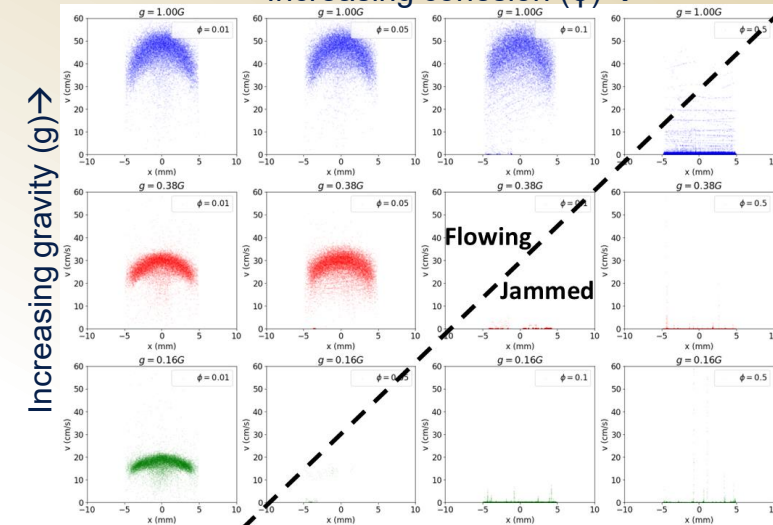
Extrapolate in Simulation



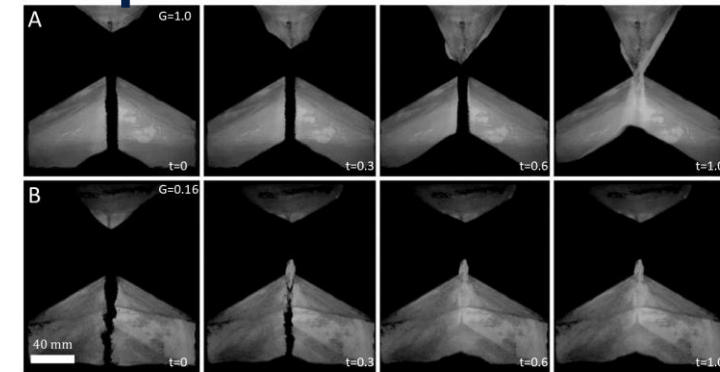
- Low cohesion simulant flows like a dry sand at 1G
- Same material jams and clogs at 0.16G

Cohesion and G controls jamming

Increasing cohesion (ϕ) →



Experimental Confirmation



Courtesy: Gries, Kollmer, D'Angelo, ZARM GTB Pro (DLR Germany)
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