
EAPS Planetary Lunch Colloquium Series (PICS)

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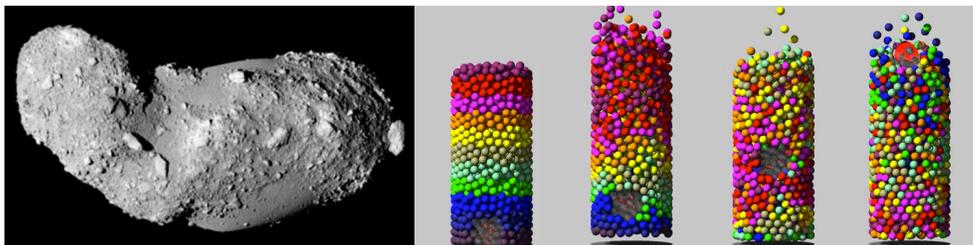
Tuesday, February 14th

12:30pm

54-517

Numerical Simulations of Oscillation-Driven Regolith Motion: Brazil-Nut Effect

Many, if not most, small asteroids are rubble piles covered by regolith, and small perturbations may be enough to disturb their surfaces in complex ways due to microgravity. Experiments to study low-gravity regolith dynamics are challenging, and properly validated numerical simulations can provide valuable insights. In this paper, we investigate, numerically, size segregation among regolith grains, which is likely to occur after repeated shaking events. In particular, we are interested in the so-called Brazil-Nut Effect (BNE), the migration of a large intruder toward the top of a vertically shaken granular system. We go a step forward in simulating this effect by implementing horizontal periodic boundary conditions (PBC) in the N -body code `pkdgrav`, with the aim of making the simulations more representative of the expected asteroid environment. We study the influence of PBC on the BNE in Earth gravity and compare them with a walled case. We also investigate the influence of static and rolling friction on the BNE. With walls, we observe the well-known convection mechanism driving the BNE. However, we find that a different mechanism, consisting of void filling, is responsible for the BNE with PBC and we discuss its relevance in light of previous studies. By running simulations in $10^{-4} g$, we show that this void-filing mechanism remains relevant in a low-gravity environment. However, we find that depending on the gravity level, the void-filing mechanism is differently influenced by the friction properties of particles. We speculate this is likely due to a change in the granular flow timescales.



For more information, contact John Biersteker (jo22395@mit.edu)