Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Jamming and unjamming in model riverbeds[1] ABE CLARK, JULIA SALEVAN, Yale University, MARK SHATTUCK, City College of New York, NICHOLAS OUELLETTE, COREY O'HERN, Yale University — When fluid flows laterally over a granular bed, it exerts shear stress on the particles. The ratio of this stress to the gravitational stress is known as the Shields number, and bulk sediment transport is thought to occur once the Shields number has passed a critical threshold. However, the particle-scale mechanisms that control this transition are not well understood. Here, we perform molecular dynamics simulations of a model riverbed to understand the particle-scale origins of jamming and unjamming in these systems. The particles interact via purely repulsive harmonic forces and are coupled to the flow using a Stokes-like drag model. The interstitial fluid velocity is determined from the local packing density using a relation similar to Darcy's law. Near the transition to sediment transport, we observe hysteresis and avalanches, and connect their statistical properties to the packing geometry at the particle scale.

[1]Funding: ARO W911NF-14-1-0005

Abe Clark
Yale University

Date submitted: 13 Nov 2014 Electronic form version 1.4