Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Disordered surface vibrations in jammed sphere packings DANIEL SUSSMAN, ANDREA LIU, University of Pennsylvania, SIDNEY NAGEL, University of Chicago — We study the vibrational properties of networks derived from jammed packings near a free surface. We find that, in addition to the usual surface modes predicted by continuum elasticity, these systems have a surface density of disordered vibrational modes extending to arbitrarily low frequencies. The spatial profile of the surface modes shows a two-length-scale decay. The length scales diverge at the jamming transition as $\Delta Z^{-1/2}$ and ΔZ^{-1}, respectively, where ΔZ is the excess coordination number above isostaticity. We speculate that these findings have implications for thin-film Lennard-Jones systems, and argue that the low-temperature jamming perspective may shed light on the physics of mobile surface layers observed in small molecule and polymeric thin films.

Daniel Sussman
University of Pennsylvania

Date submitted: 13 Nov 2014 Electronic form version 1.4