Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Subsurface Explosions in Granular Media SHUYUE LAI, RYAN HOUIM, ELAINE ORAN, Univ of Maryland-College Park — Numerical simulations of coupled gas-granular flows are used to study properties of shock formation and propagation in media, such as sand or regolith on the moon, asteroids, or comets. The simulations were performed with a multidimensional fully compressible model, GRAF, which solves two sets of coupled Navier-Stokes equations, one for the gas and one for the granular medium. The specific case discussed here is for a subsurface explosion in a granular medium initiated by an equivalent of 200g of TNT in depths ranging from 0.1m to 3m. The background conditions of 100K, 10 Pa and loose initial particle volume fraction of 25% are consistent with an event on a comet. The initial blast creates a cavity as a granular shock expands outwards. Since the gas-phase shock propagates faster than the granular shock in loose, granular material, some gas and particles are ejected before the granular shock arrives. When the granular shock reaches the surface, a cap-like structure forms. This cap breaks and may fall back on the surface and in this process, relatively dense particle clusters form. At lower temperatures, the explosion timescales are increased and entrained particles are more densely packed.

Shuyue Lai
Univ of Maryland-College Park

Date submitted: 31 Jul 2015 Electronic form version 1.4