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2D Mesoscale Simulations: Insight into Projectile Instability Penetrating Dry Sand[1] S.K. DWIVEDI, C. FELICE, J. FERNANDES, Institute for Shock Physics, Washington State University, Pullman, WA 99164-2816 — Continuing with our 2D mesoscale simulations, we present new results that provide insight into projectile instability during penetration into dry sand at impact velocities of 0.2 km/s to 2.0 km/s. The instability depends on the projectile nose shape with ogive nose being the most unstable and the flat nose being the most stable. In contrast to the loosely packed polyhedron grains or circular grains of any packing, the closely packed polyhedron grains with coincident edges cause maximum instability to the ogive nose projectile. Similarly, initial oblique impact results in more unstable behavior compared to the normal impact at any given impact velocity. Moreover, it is shown that (a) the deformation zone for a given sand body and projectile geometry depends on the friction between grains, but is otherwise independent of the impact velocity, and (b) there may exist a range of impact velocity for which the penetration of a given projectile into a given dry sand is stable. The results are presented in terms of the rotational momentum, angle of deviation, deformations zone dimensions, and the equivalent force on the projectile.

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S.K. Dwivedi
Institute for Shock Physics, Washington State University,
Pullman, WA 99164-2816

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