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Projectile Penetration into Sand Targets.

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With novel in-situ experimental measurement techniques, highly resolved qualitative observations and quantitative measurements of dynamic events within granular media can be made. This work presents the results from dynamic penetration experiments in which long rod projectiles were launched between a velocity range from 35 m/s to 350 m/s into a visually accessible sand target. High speed photography was used to capture the event. Stress measurements of the transmitted waveforms were simultaneously collected from a piezoelectric load cells buried in the sand at various locations relative to the shot line. Image correlations were used to extract velocity fields from the photographic record and correlated to the transmitted stress wave profiles. These transmitted stress profiles were compared with the DIC records. Simulations were used to better understand the dynamic fracture of grains in the near nose region of the projectile. Together these experimental and simulated results further our understanding of high speed granular penetration events.