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Probing Dynamics in Granular Media of Contrasting Geometries via X-Ray Phase Contrast Imaging and PDV RYAN CRUM, Lawrence Livermore Natl Lab, DARREN PAGAN, Cornell High Energy Synchrotron Source, JON LIND, MICHAEL HOMEL, RYAN HURLEY, ERIC HERBOLD, MINTA AKIN, Lawrence Livermore Natl Lab — Granular systems are ubiquitous in our everyday world and play a central role in many dynamic scientific problems including mine blasting, projectile penetration, astrophysical collisions, explosions, and dynamic compaction. An understanding of granular media's behavior under various loading conditions is an ongoing scientific grand challenge. This is partly due to the intricate interplay between material properties, loading conditions, grain geometry, and grain connectivity. Previous dynamic studies in granular media predominantly utilize the macro-scale analyses VISAR or PDV, diagnostics that are not sensitive to the many degrees of freedom and their interactions, focusing instead on their aggregate effect. Results of a macro-scale analysis leave the principal interactions of these degrees of freedom too entangled to elucidate. To isolate the significance of grain geometry, this study probes various geometries of granular media subjected to gas gun generated waves via in-situ X-ray analysis. Analyses include evaluating displacement fields, grain fracture, inter- and intra-granular densification, and wave front motion. Phase Contrast Imaging (PCI) and PDV analyses feed directly into our concurrent meso-scale granular media modeling efforts to enhance our predictive capabilities.

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