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Laboratory impact experiments on granular materials

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We perform laboratory impact experiments using a vertical gas gun on granular materials, with different impact geometry and energy, and target composition. The impactors are spheres or cylinders, and the targets include single component granular materials, and binary random or layered mixtures (one hard and one soft layer). Different impact angles are explored. For the layered mixtures, the impact direction is either normal or parallel to the layer interface. Crater morphology is characterized, and some scaling relations are presented. Our results bear implications to understanding general impact behavior of granular materials and terrestrial impact cratering.