

Abstract Submitted
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Study of 2D Granular Impact Dynamics with Photoelastic Particles¹ ABE CLARK, R.P. BEHRINGER, Duke University, LOU KONDIC, New Jersey Institute of Technology — What is the response of a granular material to a high speed impact from a foreign object? Our experiments consist of a large 2D granular system which is subjected to impact by an intruder from above. Using photoelastic discs and a high-speed camera (up to 775,000 fps), we are able to observe the dynamics in this process in a way which has not been done previously. We compare results to previous work on this subject, which primarily consists of macroscopic frictional models. We observe phenomena which are not captured by averaged friction models, such as large fluctuations in the acceleration of the intruder as it moves through the granular material. The high frame rates also allow us to observe rich photoelastic behavior, including propagation of acoustic waves. The photoelastic response beneath the intruder and the measured acceleration are well correlated, suggesting that a grain-scale, stick-slip description is necessary to account for the dissipation of the intruder's kinetic energy, and that much of the energy might be carried away by compressional waves.

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