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Solitary Wave Interactions in the Hertzian System PAUL ANZEL, CHIARA DARAIO, California Institute of Technology, ETH-Zurich — It is well known in nonlinear dynamics that when solitons or solitary waves collide, their interaction creates a phase change in the propagating waves. It is natural to expect a similar behavior in highly nonlinear (Nesterenko) solitary waves–waves of mechanical motion in a Hertzian system: a row of elastic spheres which have a non-linear contact force that grows as $F = kx^{3/2}$. However, while this phenomenon has been qualitatively observed in simulations, the size of the change has not been explored systematically and little experimental work has gone into confirming the phase changes. Here we present an experimental and numerical study of the phase shifts created by solitary wave interactions in both co-travelling and head-on collisions. We measure the influence of compressing the spheres, which has the effect of linearizing the system towards a Boussinesq-like equation of motion. Additionally, we measure the creation of secondary solitary waves from the interactions and compare their amplitudes to values previously found in the literature.

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