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Impact phenomena in fluidized granular matter PATRICK MAYOR, HIROAKI KATSURAGI, DOUGLAS DURIAN, University of Pennsylvania, Philadelphia — Projectiles dropped into granular media form a crater and come to rest in a particular way that has been actively investigated in numerous studies. These impact phenomena illustrate how particulate materials respond to externally applied forces. Several recent experiments have focused on the penetration of projectiles impacting granular materials at relatively low speeds, and measured the dynamics of the impact process, yielding force laws accounting for the observations. We present results showing how granular impacts are affected when the load on the grains is modified using a vertical gas flow. Balls or cylinders are dropped into a dry, noncohesive granular medium and we measure the penetration depth when gas is flown upward (thus unloading the contacts) or downward (loading the contacts). We observe that the frictional drag decreases linearly with the flow rate, and vanishes completely once the system is fluidized. Different projectile geometries allow us to separate the effect of normal and tangential frictional forces. We also consider the case of objects that are lowered quasistatically into the granular medium and measure the net vertical force exerted by the granular system on the objects at each immersion depth. We then discuss how this resistance force compares with the forces observed in actual impacts experiments.

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