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Energy Cascades in Granular Gases

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A new class of stationary states in granular gases where energy is transfered from large velocity scales to small velocity scales is found. These steady-states exist for arbitrary collision rules and arbitrary dimension. Their signature is a velocity distribution $f(v)$ with an algebraic high-energy tail, $f(v) \sim v^{-\sigma}$. The exponent σ is obtained analytically and it varies continuously with the spatial dimension, the homogeneity index characterizing the collision rate, and the restitution coefficient. These stationary states are realized in numerical simulations in which energy is injected into the system by infrequently boosting particles to high velocities. It is proposed that these states may be realized experimentally in driven granular systems.