

Anomalous Transport of inertial weakly damped particles

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The anomalous (i.e. non-Gaussian) dynamics of particles subject to a deterministic acceleration and a series of 'random kicks' is studied. Based on an extension of the concept of continuous time random walks to position-velocity space, a new fractional equation of the Kramers-Fokker-Planck type is derived. The associated collision operator necessarily involves a fractional substantial derivative, representing important nonlocal couplings in time and space. For the force-free case, a closed solution is found and discussed.