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Anomalous diffusion in one-dimensional conservative systems

Abstract

We show that for systems of one-dimensional harmonic oscillators with stochastic noise, Fourier's law does not hold and is replaced by a fractional version of it, involving fractional derivatives of order $1/2$. A crucial ingredient in the proof is the conservation of momentum, which is known to be a necessary condition for anomalous diffusion. In order to make more evident the relevance of the conservation of momentum, we describe a family of models which interpolates between normal and anomalous behavior.