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Anomalous biased diffusion in a randomly layered medium

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Abstract

We present analytical results for the biased diffusion of particles moving under a constant force in a randomly layered medium. The influence of this medium on the particle dynamics is modeled by a piecewise constant random force. The long-time behavior of the particle position is studied in the frame of a continuous-time random walk on a semi-infinite one-dimensional lattice. We formulate the conditions for anomalous diffusion, derive the diffusion laws and analyze their dependence on the particle mass and the distribution of the random force.

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