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Mimicking heterogeneous diffusion with time dependent random diffusivity.

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A considerable number of systems have recently been reported in which Brownian yet non-Gaussian dynamics was observed. These are processes characterised by a linear growth in time of the mean squared displacement, yet the probability density function of the particle displacement is distinctly non-Gaussian, and often of exponential (Laplace) shape. This behaviour has been interpreted as resulting from diffusion in inhomogeneous environments and mathematically represented through a variable, stochastic diffusion coefficient. Indeed different models describing a fluctuating diffusivity have been studied. In particular, we focus on the theory of diffusing diffusivity and consider the very generic class of the generalised Gamma distribution for the random diffusion coefficient. Moreover, addressing the first passage problem for a specific diffusing diffusivity model, we emphasize that even when the non-Gaussian character appears for certain regimes only and in the tails of the distributions (thus with low probability), it may be essential for those systems in which rare events dominate triggered actions.

Summary

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