basque center for applied mathematics

Working Seminar
(MP-Mathematical Physics
SP-Statistical Physics)

March 27, 2017, 16:00-17:00

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BROWNIAN YET NON-GAUSSIAN DIFFUSION: FROM SUPERSTATISTICS TO SUBORDINATION OF DIFFUSING DIFFUSIVITIES

A growing number of biological, soft, and active matter systems are observed to exhibit normal diffusive dynamics with a linear growth of the mean squared displacement, yet with a non-Gaussian distribution of increments. Based on the Chubinsky-Slater idea of a diffusing diffusivity we here establish and analyze a minimal model framework of diffusion processes with fluctuating diffusivity. In particular, we demonstrate the equivalence of the diffusing diffusivity process with a superstatistical approach with a distribution of diffusivities, at times shorter than the diffusivity correlation time. At longer times a crossover to a Gaussian distribution with an effective diffusivity emerges. Specifically, we establish a subordination picture of Brownian but non-Gaussian diffusion processes, that can be used for a wide class of diffusivity fluctuation statistics. Our results are shown to be in excellent agreement with simulations and numerical evaluations.

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EXCELENCIA SEVERO OCHOA

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