Anomalous diffusion: from physical phenomena to fractional calculus and vice versa

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Sažetak

Anomalous stochastic processes based on the renewal continuous time random walk model with different forms for the probability density of waiting times between individual jumps are considered. In the corresponding continuum limit fractional diffusion and Fokker-Planck equations for the probability distribution function can be derived. Different diffusion models for anisotropic, fractal and complex media lead to fractional equations description of the corresponding processes. From the other side, generalized fractional diffusion, Fokker-Planck and Langevin equations have been shown to represent useful tools for fast, slow and ultra-slow diffusion, including accelerating and decelerating anomalous diffusion.