TARGET VS. SOURCE — A NEW KIND OF FRACTIONAL FOKKER- PLANCK OPERATOR

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Starting from the topological superdiffusion concept we introduce a novel kind of fractional Fokker-Planck operator for random motion in inhomogeneous environments which incorporates the relative impact of the temporary source and target location of an underlying random walk. Dependent on the strength of this influence, the dynamics of underlying processes in weak inhomogeneities exibits distinct regimes of attenuation and enhancement. We show that in the ordinary diffusive limit the increase in the target influence slows down the process Amazingly, a superdiffusive case may either be slowed down or enhanced with increasing target influence. This funding is in contrast with the common belief that external quenched disorder generally attenuates dispersion. As our theory obeys ordinary Gibbs-Boltzmann thermodynamics we are convinced that it will facilitate the understanding of a number of anomalous transport phenomena in various fields such as foraging behaviour of animals and human dispersal on a large scale. Our results are supported by analytical perturbative analysis as well as by numerical calculations.

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