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The effect of Coulombic friction on spatial displacement statistics[1] ANDREAS MENZEL, NIGEL GOLDENFELD, University of Illinois at Urbana-Champaign — We study the effect of Coulombic (dry) friction on the spatial displacement statistics of one-dimensional stochastic motions. In other words, one of the simplest forms of nonlinear friction is added to the Fokker-Planck equation for conventional viscous Brownian motion, and its consequences are investigated. First, we find the eigenfunctions to the problem that includes the velocity component only. This problem can be mapped on the case of a quantum mechanical harmonic oscillator in the presence of a delta potential. Then we show numerically that a crossover from exponential to Gaussian displacement statistics results from the Coulombic frictional contribution. A transient regime of multiscaling is identified for the spatial distribution function. Our results are important for the interpretation of recent experiments in the field of soft matter physics: it turns out that, for practical purposes, higher order moments of the spatial distribution function must be determined to identify the presence of effective Coulombic frictional forces.

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