Diffusing colloids in the vicinity of a surface: Anomalous yet Brownian diffusion? MAXIME IGNACIO, MYKYTA V. CHUBYNSKY, GARY W. SLATER, University of Ottawa — Anomalous yet Brownian diffusion refers to a process with a linear mean-square displacement coexisting with a non-Gaussian Displacement Distribution (DispD) [1]. Chubynsky and Slater [2] proposed a model of this phenomenon in which the diffusion coefficient varies randomly in time ("diffusing diffusivity"). Recently, Bechhoefer's group has showed experimentally that diffusion of colloids near a wall exhibits non-Gaussian DispD with exponential tails. Due to hydrodynamic interactions, the diffusivity $D(r)$ is space-dependent and therefore varies in time as the particle moves in space. Qualitatively, the experimental results agree with the predictions of the diffusing diffusivity model. However, the two situations differ in details. First, space-dependent diffusivity implies the possibility of different interpretations of the stochastic term in the overdamped Langevin equation (i.e. the Ito-Stratonovich dilemma). Second, in the system of Bechhoefer et al, there is an external potential due to gravity and the electrostatic repulsion from the wall. Using Lattice Monte Carlo simulations, we explore the role of these effects. [1] B. Wang et al., PNAS 106, 15160 (2009), [2] M. V. Chubynsky and G. W. Slater, PRL 113, 098302 (2014)

Maxime Ignacio
University of Ottawa

Date submitted: 06 Nov 2015   Electronic form version 1.4