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A Continuous Time Random Walk Description of Monodisperse, Hard-Sphere Colloids below the Ordering Transition JEREMY LECHMAN, FLINT PIERCE, Sandia National Laboratories — Diffusive transport is a ubiquitous process that is typically understood in terms of a classical random walk of non-interacting particles. Here we present the results for a model of hard-sphere colloids in a Newtonian incompressible solvent at various volume fractions below the ordering transition ($\sim$50%). We numerically simulate the colloidal systems via Fast Lubrication Dynamics – a Brownian Dynamics approach with corrected mean-field hydrodynamic interactions. Colloid-colloid interactions are also included so that we effectively solve a system of interacting Langevin equations. The results of the simulations are analyzed in terms of the diffusion coefficient as a function of time with the early and late time diffusion coefficients comparing well with experimental results. An interpretation of the full time dependent behavior of the diffusion coefficient and mean-squared displacement is given in terms of a continuous time random walk. Therefore, the deterministic, continuum diffusion equation which arises from the discrete, interacting random walkers is presented. Sandia National Laboratories is a multiprogram laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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