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Are hydrodynamic interactions screened in spherically confined micro-compartments? CHRISTIAN APONTE-RIVERA, ROSEANNA ZIA, Robert Frederick Smith School of Chemical and Biomolecular Engineering — We study diffusion of hydrodynamically interacting particles confined by a spherical cavity via dynamic simulation, as a model for intracellular transport. Previous models of 3D confined transport typically assume that hydrodynamic interactions are screened and thus can be neglected, but such assumptions lead to qualitative errors in predictive models. Recent studies show that crowding does not screen hydrodynamic entrainment of freely diffusing particles in unbound suspensions, and that diffusing near a planar wall can weaken (but does not screen) hydrodynamic entrainment. Biophysical and other confined suspensions are crowded, watery compartments, suggesting a role of both crowding and confinement in hydrodynamic entrainment. In the present work, we utilize our new computational framework to study the effect of 3D micro-confinement on particle entrainment, and whether such entrainment is algebraically screened. We measure the hydrodynamic entrainment of one particle in the flow induced by another, in suspensions of arbitrary concentration. We find that the strength of entrainment varies spatially in the cavity, changes qualitatively with the size of the confined particles relative to the enclosure, but varies only quantitatively with the concentration of particles.

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