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Closing the reduced position-space Fokker-Planck equation for shear-induced diffusion using the Physalis method[1] ADAM J. SIERAKOWSKI, Johns Hopkins University, LAURA J. LUKASSEN, Max Planck Institute for Dynamics and Self-Organization — In the shear flow of non-Brownian particles, we describe the long-time diffusive processes stochastically using a Fokker-Planck equation. Previous work has indicated that a Fokker-Planck equation coupling the probability densities of position and velocity spaces may be appropriate for describing this phenomenon (Lukassen & Oberlack, Phys. Rev. E 89, 2014). The stochastic description, integrated over velocity space to obtain a reduced position-space Fokker-Planck equation, contains unknown space diffusion coefficients. In this work, we use the Physalis method for simulating disperse particle flows (Sierakowski & Prosperetti, J. Comp. Phys., 2016) to verify the colored-noise velocity space model (an Ornstein-Uhlenbeck process) by comparing the simulated long-time diffusion rate with the diffusion rate proposed by the theory. We then use the simulated data to calculate the unknown space diffusion coefficients that appear in the reduced position-space Fokker-Planck equation and summarize the results.

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Adam J. Sierakowski
Johns Hopkins University

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