Particle migration of colloidal and Brownian suspensions in both Poiseuille and circular Couette flow\textsuperscript{1} CHANGWOO KANG, PARISA MIRBOD, University of Illinois at Chicago — The flow of neutrally buoyant and hard-sphere colloidal particles concentrated in a Newtonian viscous fluid is examined by direct numerical simulations (DNS) at various bulk particle volume fraction (0.1 $\leq \phi_b \leq 0.5$) and Peclet number ($10^{-2} \leq Pe \leq 10^3$). We use the diffusive flux model (DFM) to describe the behavior of suspensions and employ the viscosity introduced by de Kruif et al. [J. Chem. Phys. 1985] which is given as a function of shear rate and volume fraction. First, we consider pressure-driven flow of colloidal particles in a channel. For low $Pe$ number the concentration profile flattens, as $Pe$ grows the influence of Brownian motion diminishes and the distribution of concentration reaches the profile of non-colloidal suspensions flow. Also, as Brownian motion becomes dominant, the volume flow rate decreases steadily. We then study a circular Couette flow of colloidal suspensions where the inner cylinder rotates with a constant angular velocity and the outer one is fixed. The concentration profile flattens out and the local shear rate decays with the reduction of $Pe$ number. The torque acting on the inner cylinder builds up due to colloidal suspensions.

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