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Bias in Near-Wall Microscale Velocimetry due to Hindered Brownian Diffusion[1] REZA SADR, HAIFENG LI, MINAMI YODA, Georgia Institute of Technology — Brownian fluctuations of colloidal tracers used in microscale velocimetry are isotropic in the bulk. In the near-wall region, however, such fluctuations are hindered, and the tracer has a greater probability of diffusing away from (*vs.* towards) the wall. These anisotropic fluctuations can lead to overestimation of near-wall velocities measured using particle-based velocimetry. Hindered Brownian dynamics simulations were used to quantify this error as a function of tracer size, time interval within the image pair, spatial resolution normal to the wall, and fluid properties. The flow velocity based on particle displacements is consistently higher than its actual value for time intervals exceeding a Brownian diffusion timescale. The simulation data were used to generate a probability density function of the distances normal to the wall z sampled by the tracers. A method for rescaling near-wall velocity data using a Gaussian approximation of this PDF is presented, and the implications of this type of bias error on near-wall parameters such as slip length are briefly discussed.

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