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A maximum likelihood algorithm for the reconstruction of velocity profile with nano-PIV CHRISTEL HOHENEGGER, PETER MUCHA, School of Mathematics, Georgia Institute of Technology — At nano-scale, images of particle flows near a channel wall are obtained combining standard PIV techniques with evanescent wave illumination [R. Sadr et al., J. Fluid Mech. 506, 357-367 (2004)]. Assuming a Langevin description with experimentally known diffusion tensor and a fluid velocity profile directed in one-in-plane direction, we simulate linear, parabolic and electro-osmotic flow with a Milstein scheme of both strong- and weak-order 1. We develop a maximum likelihood algorithm to reconstruct the dependence of the in-plane velocity profile from the out-ot-plane direction. We use PIV simulated particle images and assume an uniform out-of-plane distribution. We further compare the results obtained with two different forms of the probability density function for the in-plane displacement. Next we discuss the validity of the model and of the reconstruction in light of the comparison with true experimental data, in particular the difficulties encountered when assuming a non-uniform out-of-plane distribution. Finally we identify the values of the physical parameters guarantying the validity of the reconstruction algorithm.

Christel Hohenegger
School of Mathematics, Georgia Institute of Technology

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