1036-76-54 **Stefan B Maehlmann*** (sbm4@njit.edu), Department of Mathematical Sciences, New Jersey Institute of Technology, University Heights, Newark, NJ 07102-1982. *Effects of electric fields and inertia on the deformation of liquid drops in simple shear flow.*

The motion of liquid drops in a Couette-flow device is a fundamental problem arising in several applications ranging from analytical chemistry to controlled release to micro-engineered materials with specialized biological, chemical and optical properties. The present study formulates and studies computationally the dynamics of two-dimensional viscous drops subjected to a linear shear. A novel physical feature in our study is the imposition of a vertical electrocstatic field in the channel gap. This is achieved by imposing a constant voltage potential difference between the device walls which act as electrodes. The mathematical model to solve the free-boundary problem relies on the level-set technique coupled with a finite difference solution of the Navier-Stokes equations and a multi-grid approximation of the non-separable Laplace equations governing the electric field potential. We discuss the details of the method and present the results of our numerical experiments on the effects of electric fields, inertia and surface tension on the deformation of liquid drops in shear-driven flow as function of Reynolds number, Capillary number, and electric Weber number. (Received January 01, 2008)