Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

**The unified slip boundary condition: addressing the breakdown of the no-slip boundary condition**[1] JOSEPH THALAKKOTTOR, KAMRAN MOHSENI, University of Florida — The no-slip boundary condition has been contested for over a century. Although it has been successful in reproducing most continuum and macroscopic results, the condition breaks down in situations such as contact line motion, corner flow and in many micro- and/or nano-scale applications. The widely used Maxwell and Navier slip boundary conditions make an implicit assumption that velocity varies only in the wall normal direction. This assumption is not applicable in the vicinity of a contact and a corner point, where velocity varies in wall-normal and wall-tangential directions. Here, we present a generalized velocity boundary condition that shows that slip velocity is a function of not only the shear rate but also the linear strain rate. In addition, we present a universal relation for slip length which shows that, for a general flow, slip length is a function of the principal strain rate. The universal relation for slip length along with the generalized velocity boundary condition provides a unified slip boundary condition to model a wide range of steady Newtonian fluid flows.

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Date submitted: 01 Aug 2016 Electronic form version 1.4