

Abstract Submitted  
for the DFD09 Meeting of  
The American Physical Society

**Navier-slip and other viscous flow boundary conditions using penalty methods**<sup>1</sup> YVONNE STOKES, The University of Adelaide, GRAHAM CAREY, University of Texas at Austin — With the advent of microscale and nanoscale devices, the Navier-slip boundary condition as a macroscale model of fluid behaviour at a solid wall has seen renewed interest. The penalty concept and variational formulation are extended here to treat partial slip, free surface, contact and related boundary conditions for boundaries of general shape in viscous flow simulation. We analyse the penalty partial-slip formulation and relate it to the classical Navier-slip condition. A variant of the same penalty scheme also allows partial penetration through a boundary and, hence, the implementation of porous wall boundaries with leakage or “blowing and suction.” Finally the scheme can be employed in a novel way to handle moving contact lines.

<sup>1</sup>This research was supported by Australian Research Council grant DP0450047, a University of Adelaide Special Studies Program grant, and the Curran Chair and ICES faculty visitor fellowship program at the University of Texas at Austin.

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Date submitted: 06 Aug 2009

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