

Abstract Submitted  
for the DFD05 Meeting of  
The American Physical Society

**Reduced Navier-Stokes Equations Near a Flow Boundary**

MUSTAFA KILIC, GUSTAAF JACOBS, GEORGE HALLER, MIT — We derive a hierarchy of PDEs for the leading-order evolution of wall-based quantities, such as skin-friction and the wall-pressure gradient, in two-dimensional fluid flows. The resulting Reduced Navier-Stokes Equations are defined on the boundary of the original flow domain, hence have reduced spatial dimensionality. This has advantages both for computation and flow control-design. Members of the RNS hierarchy are well-posed if appended with boundary conditions from wall-based sensors. For several benchmark problems, our numerical simulation show close finite-time agreement between the solutions of RNS and those of the full Navier-Stokes equations.

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Date submitted: 29 Jul 2005

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