Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Spanwise Varying Open-Loop Control of a Backward-Facing Step Flow[1] AARON BAUGH, STUART GILBERT, MARC SCHOSTEK, DAVID BREAKEY, LORENZ SIGURDSON, Vortex Fluid Dynamics Lab, University of Alberta — We are experimentally investigating active control of the reattaching shear layer downstream of a backward-facing step in water. Transitional and turbulent separation bubbles are studied. Control is achieved using 128 hydraulic suction-and-blowing actuation ports along the span at the corner of the step where the flow first separates, inspired by Sakakibara and Anzai's design for a plane jet [*Phys. Fluids* 13, 1541 (2001)]. Perturbation magnitudes vary in space across the span of the step, and each port's perturbation is periodic with zero-net mass flux. This actuation technique is the physical manifestation of some of the numerical simulations of Kang and Choi [*J. Fluid Mech.* 463, 201 (2002)]. We use backlit dye to track the evolution of vorticity in the reattaching shear layer. Tufts, which have been more commonly employed in aerodynamic studies, are adapted here for use in water. An array of approximately 1000 tufts is in place downstream of the step to examine the effects of the control schemes on the length of the recirculation bubble.

[1]We gratefully acknowledge NSERC Discovery Grant 41747.

Lorenz Sigurdson
Vortex Fluid Dynamics Lab, University of Alberta

Date submitted: 07 Aug 2009 Electronic form version 1.4