Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

**Groove Optimization for Drag Reduction** A. MOHAMMADI, JERZY FLORYAN, University of Western Ontario — It has been shown that long-wavelength, longitudinal grooves reduce pressure losses in laminar, pressure driven flows. This work is focused on the search for the groove shapes that maximize the reduction of such losses. It is shown that the optimal shapes can be characterized using reduced geometry models involving just a few Fourier modes. Two classes of grooves have been considered, i.e. equal-depth grooves, which have the same height and depth, and unequal-depth grooves. It has been shown that the optimal grooves in the former cases are characterized by a certain universal trapezoid. There exists an optimum depth in the latter case and this depth, combined with the corresponding groove shape, defines the optimal geometry; this shape is well-approximated by a delta function. The maximum possible drag reduction has been determined for the optimal shapes. The analysis has been extended to kinematically-driven flows. It has been shown that in this case the longitudinal grooves always increase flow resistance regardless of their shape.

Jerzy Floryan
University of Western Ontario

Date submitted: 02 Aug 2013 Electronic form version 1.4