Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Turbulent flow drag reduction on hybrid riblet superhydrophobic surfaces[1] JULIE CROCKETT, RICHARD PERKINS, DANIEL MAYNES, Brigham Young University — We investigate characteristics of turbulent flow in a mini-scale channel where one of the walls is structured with riblets, superhydrophobic microribs, or a hybrid surface that has both structure types present. Individually, large scale riblets, approximately 80 microns tall with 160 micron spacing, provide drag reduction through damping spanwise turbulent motions, and superhydrophobic surfaces, with nearly an order of magnitude smaller features, provide drag reduction through apparent slip at the wall. It is postulated that the combination of the structures will yield a more significant drag reduction than either alone. Experiments were conducted in a rectangular channel with one wall comprised of superhydrophobic features, riblets, or the combination of the two and for channel Reynolds numbers ranging from 4500 to 20000. The velocity profile, turbulent statistics, and shear stress profile are observed using PIV measurements. In addition friction factor and turbulence production are extracted from the PIV data. Modest drag reductions were observed for both the superhydrophobic and riblet surfaces. The combined surfaces showed the greatest drag reduction and turbulence production was significantly reduced for these surfaces.

[1]NSF Grant No. 1066356

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Date submitted: 01 Aug 2014 Electronic form version 1.4