Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Investigation of Wall Shear Stress Behavior for Rough Surfaces with Blowing[1] JACOB HELVEY, COLBY BORCHETTA, University of Kentucky, MARK MILLER, Princeton University, ALEXANDRE MARTIN, SEAN BAILEY, University of Kentucky — We present an experimental study conducted in a turbulent channel flow wind tunnel to determine the modifications made to the turbulent flow over rough surfaces with flow injection through the surfaces. Hot-wire profile results from a quasi-two-dimensional, sinusoidally-rough surface indicate that the effects of roughness are enhanced by momentum injection through the surface. In particular, the wall shear stress was found to show behavior consistent with increased roughness height when surface blowing was increased. This observed behavior contradicts previously reported results for regular three-dimensional roughness which show a decrease in wall shear stress with additional blowing. It is unclear whether this discrepancy is due to differences in the roughness geometry under consideration or the use of the Clauser fit to estimate wall shear stress. Additional PIV experiments are being conducted for a three-dimensional fibrous surface to obtain Reynolds shear stress profiles. These results provide an additional method for estimation of wall-shear stress and thus allow verification of the use of the Clauser chart approach for flows with momentum injection through the surface.

[1]This research is supported by NASA Kentucky EPSCoR Award NNX10AV39A, and NASA RA Award NNX13AN04A

Sean Bailey
University of Kentucky

Date submitted: 01 Aug 2014 Electronic form version 1.4