Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Flow Mechanisms Leading to Separation Control over Embedded Hexagonal Cavities AMY LANG, BLAKE MELNICK, University of Alabama — Digital Particle Image Velocimetry was used to measure the flow over an array of hexagonal cavities, with a focus on discerning the effect of cavity orientation on the adjacent boundary layer flow. Time-averaged velocity profiles above the cavities were measured under transitioning and turbulent boundary layer conditions. Two flow mechanisms leading to separation control, produced by the presence of the embedded cavities, were considered and will be discussed: (1) the presence of a partial slip velocity, produced by the embedded vortices forming within the cavities, on the adjacent boundary layer flow; and (2) turbulence augmentation close to the surface leading to a greater momentum exchange with the higher momentum, outer boundary layer region. The Reynolds stresses over the hexagonal cavities were thus compared to those over the flat plate under turbulent conditions to attempt to discern the effect of cavity orientation on turbulence augmentation. Results will discuss how these flow mechanisms lead to higher momentum in the boundary layer close to the wall as compared to a flat plate.

Amy Lang
University of Alabama

Date submitted: 22 Jul 2009 Electronic form version 1.4