Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Reversing flow development in a separating turbulent boundary layer[1] LEONARDO SANTOS, AMY LANG, REDHA WAHIDI, ANDREW BONACCI, The University of Alabama — Fast swimming sharks have microstructures on their skin consisting of bristling scales. These scales are hypothesized to bristle in response to backflow generated from the separated turbulent boundary layer (TBL) in regions of adverse pressure gradient (APG) on the shark body. Vortices are trapped in the cavities between the scales, which induce momentum exchange between the higher momentum fluid in the outer flow and that in the separated region. This momentum exchange causes reattachment of the separated TBL, causing the scales to return to the unbristled location, and the cycle continues. The rows of scales have widths that are comparable to the spanwise length scale of the intermittent backflow patches that appear in the region of incipient detachment of TBLs. In this experimental investigation, correlations between the shark scale's width and the spanwise size of the low backflow streaks are examined, as well as details of the incipient detachment region. The experiments are conducted in a water tunnel facility and the flow field is measured using PIV. Turbulent boundary layers are subjected to an APG via a rotating cylinder. Separated TBLs are investigated on a flat plate.

[1]The authors would like to greatfully acknowledge the Army Research Office for funding this project.

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Date submitted: 01 Aug 2016 Electronic form version 1.4