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An Experimental Study of Flow Separation over a Flat Plate with 2D Transverse Grooves[1] EMILY JONES, AMY LANG, FARHANA AFROZ, JENNIFER WHEELUS, DREW SMITH, University of Alabama — It has been hypothesized that flexible shark scales may aid in controlling boundary layer separation in that the scales bristle when encountering a localized flow reversal, thereby forming cavities within the skin that trap vortices between the scales. The formation of the embedded vortices can lead to the creation of a partial slip condition over the surface as well as turbulence augmentation in the boundary layer. In an attempt to replicate and study these effects on flow separation, a simplified model of the shark skin consisting of a plate with square 2D transverse grooves was utilized. Separation over the plate was induced via the placement of a rotating cylinder above the surface, and the experiments were carried out in a water tunnel with a tripped turbulent boundary layer. Using DPIV to analyze the flow, the results were compared to separation occurring over a flat plate. The effects on the location of separation and length of the separated flow region were all analyzed as a function of the Reynolds number and strength of the adverse pressure gradient induced by the rotating cylinder.

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