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Turbulent Boundary Layer Separation Induced over a Flat Plate by a Rotating Cylinder[1] FARHANA AFROZ, EMILY JONES, DREW SMITH, JENNIFER WHEELUS, AMY LANG, University of Alabama — A novel technique to generate and control an adverse pressure gradient (APG) over a flat plate was implemented by using a rotating cylinder for the purpose of studying turbulent boundary layer (TBL) separation. For this experiment, a flat plate and a fixed diameter cylinder were mounted vertically in a water tunnel to investigate the flow field where the boundary layer was tripped to the turbulent state. Variability in the strength of the APG induced on the plate was achieved using the rotation speed of the cylinder. Digital Particle Image Velocimetry (DPIV) was used to investigate the nature and extent of TBL separation induced by the cylinder rotation. Moreover, a theoretical, inviscid flow calculation of the pressure coefficient induced by the rotating cylinder on the flat plate was performed to predict the strength of the APG. Location of separation, percentage mass flow reversal, and length of the separated flow region were all analyzed as a function of the Reynolds number and strength of the APG.

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