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Turbulent Boundary-Layer of Power-law Fluids Near a Position of Separation. JULIANA LOUREIRO, ATILA SILVA FREIRE[1], Federal University of Rio de Janeiro — The study describes the turbulent boundary layer structure near and at a separation point for power-law fluid flows. Experimental work is performed for flow of water and a 0.1% carboxymethyl cellulose (CMC) water blend, over an asymmetric plane diffuser with 30-degree slope. The flow index n and the consistency parameter K are respectively 0.86 and 0.00753 (Pa s^n). Particle Image Velocimetry and Laser Doppler Velocimetry are used to introduce profiles of local mean velocity, turbulent shear stresses at the points of separation, reattachment and in the recirculation region. The location of the separation and reattachment points are described in terms of changes in the generalized Reynolds number based on the channel height. Experiments are conducted for two different Reynolds numbers. The work reports large changes in the length of the separation regions and discusses the local solutions of Goldstein (1948) and Stratford (1959). In the fully viscous region, the mean velocity is shown to vary as $y^{(n+1/n)}$, as expected from the local analytical solution, with y as the distance from the wall. In the fully turbulent region, the mean velocity profile follows a $y^{1/2}$ law, being thus independent of rheology of the fluid.

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