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Pressure gradient influence in turbulent boundary layers NICO REUTHER, CHRISTIAN J. KAEHLER, Institute of Fluid Mechanics and Aerodynamics, Bundeswehr University, Munich — Understanding wall-bounded turbulence is still an ongoing process. Although remarkable progress has been made in the last decades, many challenges still remain. Mean flow statistics are well understood in case of zero pressure gradient flows. However, almost all turbulent boundary layers in technical applications, such as aircrafts, are subjected to a streamwise pressure gradient. When subjecting turbulent boundary layers to adverse pressure gradients, significant changes in the statistical behavior of the near-wall flow have been observed in experimental studies conducted however the details dynamics and characteristics of these flows has not been fully resolved. The sensitivity to Reynolds number and the dependency on several parameters, including the dependence on the pressure gradient parameter, is still under debate and very little information exists about statistically averaged quantities such as the mean velocity profile or Reynolds stresses. In order to improve the understanding of wall-bounded turbulence, this work experimentally investigates turbulent boundary layer subjected to favorable and adverse pressure gradients by means of Particle Image Velocimetry over a wide range of Reynolds numbers, $4200 < \mathrm{Re}_\tau < 13400$. The contribution of the coherent structures to the mean flow statistics was found to increase significantly for a flow subjected to an adverse pressure gradient.

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