

Abstract Submitted
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Experimental study of a turbulent flow under transient conditions SHUISHENG HE, SAM GORJI, MEHDI SEDDIGHI, University of Sheffield, TOM O'DONOGHUE, DUBRAVKA POKRAJAC, University of Aberdeen, ALAN VARDY, University of Dundee — Particle Image Velocimetry (PIV) is applied to investigate the behaviour of transient turbulent channel flows. During the experiments, the flowrate is accelerated from a lower Re turbulent flow to one at a higher Re. The investigations reveal novel insights into turbulence behaviour in the transient process. It is shown that the unsteady flows behave strikingly similar to the so-called boundary layer bypass transition due to free-stream-turbulence. Consistent with the DNS of He and Seddighi (J. Fluid Mech., 715: 60-102), the process begins with the elongation of streaks much similar to the Klebanoff modes in the buffeted laminar boundary layer in a bypass transition. During the second stage, the formation and propagation of isolated turbulent spots eventually lead to a complete breakdown of the organised streaky structures resulting in a new turbulent flow corresponding to the final Reynolds number. The present investigation covers a range of initial and final Reynolds numbers to elucidate the underlying mechanisms involved in transient flows.

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