

Abstract Submitted  
for the DFD14 Meeting of  
The American Physical Society

**A study of transient channel flow in a transitionally rough regime** MEHDI SEDDIGHI, SHUISHENG HE, University of Sheffield, TOM O'DONOGHUE, DUBRAVKA POKRAJAC, University of Aberdeen, ALAN VARDY, University of Dundee — DNS has been used to investigate the transient behaviour of turbulence following a rapid flow acceleration from an initially turbulent flow in a channel with a smooth top wall and a roughened bottom wall made of close-packed pyramids. Simulations have been performed at various flow conditions in the transitionally rough regime with equivalent roughness heights ( $k_s^+$ ) ranging from 12 to 42. It is shown that the transient responses of the flow over the smooth and rough walls are practically independent of each other. Also, the nature of the process over the rough wall varies strongly as the influence of the roughness increases during the early stages of the acceleration. Whereas the transient flow over the smooth-wall undergoes a process strikingly similar to laminar-turbulent bypass transition, the corresponding behaviour over the rough wall depends on the wall condition. When the equivalent roughness height of the final flow condition is below  $\sim 30$ , bypass-like transition dominates, although the roughness induces early transition. When  $k_s^+ > 30$ , however, the rough-wall flow undergoes a highly transient process resembling roughness induced transition.

Mehdi Seddighi  
University of Sheffield

Date submitted: 31 Jul 2014

Electronic form version 1.4