Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Dependence of near-wall flow on the higher moments of a multi-scale rough surface THOMAS JELLY, SOTIRIOS SARAKINOS, ANGELA BUSSE, University of Glasgow — Fully developed turbulent channel flow past irregular multi-scale surface roughness has been investigated using direct numerical simulation (DNS) at a fixed friction Reynolds number of 395. The details of a surface generation algorithm — which permits realistic rough surfaces to be synthesised with specified statistical properties for either experimental or computational studies — will be outlined and discussed. The aim of the current work is to investigate the response of the near-wall region to systematic changes of higher order surface statistics, such as skewness and kurtosis. The influence of higher order moments is examined using double-averaged statistics of the turbulent flow which is decomposed into mean, dispersive and stochastic components. First-order roughness effects are investigated by quantifying the roughness function and examining the inner-scaled mean streamwise velocity profile. Second-order roughness effects are investigated by quantifying the relative magnitude of dispersive and Reynolds stresses in the near-wall region as a function of the surface skewness and kurtosis. Finally, modifications to the near-wall turbulence structure are examined by quantifying two-point velocity correlations for both the dispersive and stochastic components.

Thomas Jelly
University of Glasgow

Date submitted: 30 Jul 2017 Electronic form version 1.4