Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Dynamic wall shear stress measurements in a turbulent channel flow OMID AMILI, JULIO SORIA, Laboratory for Turbulence Research in Aerospace and Combustion, Department of Mechanical and Aerospace Engineering, Monash Uni., VIC 3800, Australia — To quantify and understand the dynamics of near wall momentum transfer, high spatial resolution, time-resolved measurements of wall shear stress distribution are essential. In this study, a film-based shear stress sensor has been used to measure the time-resolved local wall shear stress distribution in a turbulent channel flow. Measurements have been undertaken in a turbulent channel flow at Reynolds numbers up to 130,000 based on the bulk velocity and channel height. The measured fluctuating wall shear stress distribution provides spatio-temporal information of the characteristics of near wall structures by detecting their footprints. The span-wise extent of the positive two-point correlation of the stream-wise shear stress fluctuations provides the average width in the order of 100 wall units for the near-wall coherent structures. An investigation of the topological features of the velocity gradient and rate of strain tensors enables us to show an intrinsic characteristic of the near wall flow, which follows a two-dimensional flow pattern.

Omid Amili
Laboratory for Turbulence Research in Aerospace and Combustion,
Department of Mechanical and Aerospace Engineering,
Monash Uni., VIC 3800, Australia

Date submitted: 04 Aug 2010 Electronic form version 1.4