## Abstract Submitted for the DFD10 Meeting of The American Physical Society

Time-evolution and time-scales of topological structures in a turbulent boundary layer through conditional mean trajectory analysis<sup>1</sup> CALLUM ATKINSON, Laboratory for Turbulence Research in Aerospace and Combustion, Monash University, SERGEI CHUMAKOV, IVAN BERMEJO-MORENO, Center for Turbulence Research, Stanford University, XIAOHUA WU, Department of Mechanical Engineering, Royal Military College of Canada, JULIO SORIA, Laboratory for Turbulence Research in Aerospace and Combustion, Monash University — The Lagrangian evolution of the invariants of the velocity gradient tensor in wallbounded turbulence is examined using conditional mean trajectories (CMT). Fields from direct numerical simulations of a turbulent boundary layer developing over a flat plate with fully turbulent flow over a Reynolds number range of  $Re_{\theta} = 730$  to 1954 are used to extract the CMT in the invariant space of the velocity gradient tensor  $(Q_A, R_A)$ , the invariant space of the strain-rate tensor  $(Q_S, R_S)$  and the invariant space of the rate-of-rotation tensor  $(Q_W, R_W)$ . CMT are considered for the full boundary layer, the log layer and the log and buffer layers. Results show a cyclic evolution of local topology. Associated time scales are extracted and compared with homogeneous isotropic turbulence.

<sup>1</sup>Supported by CTR Summer Program and the Australian Research Council.

Callum Atkinson Laboratory for Turbulence Research in Aerospace and Combustion, Monash University

Date submitted: 09 Aug 2010 Electronic form version 1.4