Vortex convection velocities in wall parallel planes of a turbulent boundary layer\textsuperscript{1} JEFFREY A. LEHEW, MICHELE GUALA, BEVERLEY J. MCKEON, California Institute of Technology — The organization and convection velocity of vortices in wall parallel planes of a zero-pressure gradient turbulent boundary layer are investigated using time resolved digital particle image velocimetry (DPIV) at a moderate Reynolds number ($Re_\tau = 470$). Time resolved DPIV provides a means for tracking vortical structures in the flow giving their trajectories, velocities, and relation to other turbulent structures in the flow. Measurements are taken at three different wall normal locations ($y/\delta = 0.07, 0.23, \text{ and } 0.59$) and comparisons of the vortex populations and convection velocities are made between the three planes. Vortical structures captured in these planes may be interpreted as signatures of hairpin-like structures which have been proposed to play a key role in turbulent boundary layer dynamics.

\textsuperscript{1}Support from AFOSR under award # FA9550-09-1-0701 (program manager John Schmisseur) is gratefully acknowledged.

Jeffrey A. LeHew
California Institute of Technology

Date submitted: 03 Aug 2010

Electronic form version 1.4