Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Statistical structure and scaling behaviors of spanwise vorticity in smooth-wall turbulent boundary layers[1] JOSEPH KLEWICKI, University New Hampshire/Melbourne, CALEB MORRILL-WINTER, IVAN MARUSIC, University of Melbourne — Within the canonical turbulent boundary layer the spanwise component of vorticity, ω_z, is the only component that has a non-negligible mean value. For this and other reasons, the motions bearing ω_z play a central role in boundary layer dynamics. A compact four element ('Foss-style') hotwire probe was used to acquire well-resolved ω_z fluctuation time series over an unprecedented Reynolds number range, $1,500 \leq \delta^+ = \delta u_\tau/\nu \leq 15,000$. Very good spatial resolution ($\leq$ 9 viscous units) was maintained over the entire δ^+ range by leveraging the low speed and large scale attributes of the HRNBLWT and FPF wind tunnels at Melbourne and New Hampshire, respectively. The present talk documents the behaviors of the statistical moments and frequency spectra of the ω_z fluctuations, and further explores the self-similarity between the mean and rms profiles seen at low Reynolds number. The observed ω_z behaviors are discussed relative to mean dynamical structure and the asymptotic properties of the boundary layer vorticity field.

[1]The support of the Australian Research Council and the National Science Foundation are gratefully acknowledged.

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Date submitted: 30 Jul 2014 Electronic form version 1.4