Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Vortex organization in wall turbulence: inner or outer scaling?[1]
MICHELE GUALA, JEFF LEHEW, GALCIT, California Institute of Technology, MEREDITH METZGER, Dep. Mechanical Engineering, University of Utah, BEVERLEY MCKEON, GALCIT, California Institute of Technology — Simultaneous hotwire measurements in the near-neutral atmospheric surface layer at $Re_\tau = \delta u_\tau/\nu \simeq 10^6$ are compared with time-resolved PIV measurements in a flat plate turbulent boundary layer at $Re_\tau = 5 \cdot 10^2$. We observe in both flows a similar strong signature in the two point correlation function of the streamwise velocity fluctuation near the wall, confirming the key statistical role of ramp-like vortex organization. However, at the lower Reynolds number, the organized structures were observed to extend up to the boundary layer thickness δ, implying that in the atmospheric surface layer we should observe similar patterns up to heights of the order of 50 m, providing outer scaling holds. The effect of the Reynolds number on the scaling of ramp-like structures, hairpins and hairpin packets (Adrian, 2007) is investigated.

[1]We acknowledge the support by ONR grant #N00014-08-1-0897 (program manager Ron Joslin).

Michele Guala
GALCIT, California Institute of Technology

Date submitted: 09 Sep 2009 Electronic form version 1.4