Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Re-examing the logarithmic dependence of the mean velocity distribution in polymer drag reduced wall-bounded flow CHRISTOPHER WHITE, University of New Hampshire, YVES DUBIEF, University of Vermont, JOE KLEWICKI[1], University of New Hampshire — The logarithmic dependence of the mean velocity distribution in polymer drag reduced wall-bounded flows is re-examined to study the effect of drag-reducing polymers on the von Kármán constant and to determine if the "ultimate profile," corresponding to the state of maximum drag reduction, is truly logarithmic. The results of our findings show very different behaviors of the mean velocity distribution in polymer drag reduced flows than the classical view. First it is shown that at low drag reduction (DR) the slope of the logarithmic overlap region increases with increasing DR. Next, at some relatively high DR (which likely depends on Re), the inertially dominated logarithmic overlap region is eradicated. After which, the mean velocity distribution has a similar shape as a laminar flow and the perceived logarithmic scaling behavior corresponds to a thickened buffer layer and is not truly logarithmic.

[1]Also at University of Melbourne

Christopher White
University of New Hampshire

Date submitted: 09 Aug 2011 Electronic form version 1.4