Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Thermal Transport Phenomena in the Quasi-laminarization Process of Turbulent Boundary Layers LUCIANO CASTILLO, GUILLERMO ARAYA, FAZLE HUSSAIN, Texas Tech University — Direct Numerical Simulation of a spatially evolving turbulent boundary layer subject to strong favorable pressure gradient (SFPG) with eventual quasi-laminarization has been performed to include the thermal field. In this talk, the following questions will be addressed: i) to which extend the Reynolds analogy is satisfied during flow laminarization? ii) can the thermal boundary layer under quasi-laminarization be described as two quasi-independent inner/outer regions? To the best of our knowledge, documented investigation regarding heat transfer phenomena associated with quasi-laminarization process of spatially developing boundary layers is rather scarce. In order to introduce realistic thermal inlet fluctuations in a SFPG we employed the multi-scale technique for thermal boundary layers devised by Araya and Castillo PoF (2013). Such methodology enable us to more effective capture the pressure gradient and thermal field than using a single scaling approach. It is shown that the Reynolds normal stresses for the streamwise component remains frozen in space while the wall-normal and spanwise components continue to decrease as the flow moves downstream and never becomes laminar due to the survival of the upstream turbulence during dissipation on viscous time scales.

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Date submitted: 01 Aug 2014 Electronic form version 1.4