Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Compressibility effect on thermal coherent structures in spatially-developing turbulent boundary layers via DNS[1] GUILLERMO ARAYA, Univ of Puerto Rico - Mayaguez, KENNETH JANSEN, Univ of Colorado - Boulder — DNS of compressible spatially-developing turbulent boundary layers is performed at a Mach number of 2.5 over an isothermal flat plate. Turbulent inflow information is generated by following the concept of the rescaling-recycling approach introduced by Lund et al. (J. Comp. Phys. 140, 233-258, 1998); although, the proposed methodology is extended to compressible flows. Furthermore, a dynamic approach is employed to connect the friction velocities at the inlet and recycle stations (i.e., there is no need of an empirical correlation as in Lund et al.). Additionally, the Morkovins Strong Reynolds Analogy (SRA) is used in the rescaling process of the thermal fluctuations from the recycle plane. Low/high order flow statistics is compared with direct simulations of an incompressible isothermal ZPG boundary layer at similar Reynolds numbers and temperature regarded as a passive scalar. Focus is given to the effect assessment of flow compressibility on the dynamics of thermal coherent structures.

[1]AFOSR FA9550-17-1-0051

Guillermo Araya
Univ of Puerto Rico - Mayaguez

Date submitted: 01 Aug 2017 Electronic form version 1.4