Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Multi-scale geometric analysis of evolving Lagrangian structures in the compressible transitional boundary layer at $Ma = 0.7$[1] WENJIE ZHENG, YUE YANG, SHIYI CHEN, State Key Laboratory for Turbulence and Complex Systems, College of Engineering, Peking University, Beijing 100871, China — Evolutionary geometry of flow structures in a compressible transitional boundary layer at $Ma = 0.7$ is investigated from a Lagrangian perspective. The Lagrangian structures in the transition are extracted from the Lagrangian scalar field by a moving window filter, and then their geometry is characterized by the multi-scale and multi-directional geometric analysis (Yang and Pullin, *J. Fluid Mech.*, 674, 2011), including the averaged inclination and sweep angles at different scales ranging from one half of the boundary layer thickness to several viscous length scales δ_ν. The results show that averaged angles are almost unaltered for different scales before the transition. As the transition occurs, averaged inclination angles increase and sweep angles decrease rapidly with increasing reference time. Furthermore, the orientation changes more significantly for structures with small scales than large scales. In the late stage of transition, the averaged inclination angle of small-scale structures with the length scale $\sim O(10)\delta_\nu$ is $42\,^\circ$, and the averaged sweep angle in the logarithm law region is approximately $30\,^\circ$.

[1]This work is supported in part by NSFC (No. 11472015) and the Thousand Young Talent Program of China

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Date submitted: 31 Jul 2015 Electronic form version 1.4