Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Effects of the Mach number on the evolution of vortex-surface fields in compressible Taylor-Green flows[1] NAIFU PENG, YUE YANG, Peking Univ — We investigate the evolution of vortex-surface fields (VSFs) in viscous compressible Taylor-Green flows. The VSF is applied to the direct numerical simulation of the Taylor-Green flows at a range of Mach numbers from $Ma = 0.6$ to $Ma = 2.2$ for characterizing the Mach-number effects on evolving vortical structures. We find that the dilatation and baroclinic force strongly influence the geometry of vortex surfaces and the energy dissipation rate in the transitional stage. The vortex tubes in compressible flows are less curved than those in incompressible flows, and the maximum dissipation rate occurs earlier in high-Mach-number flows perhaps owing to the conversion of kinetic energy into heat. Moreover, the relations between the evolutionary geometry of vortical structures and flow statistics are discussed.

[1]This work has been supported in part by the National Natural Science Foundation of China (Grant Nos. 11522215 and 11521091), and the Thousand Young Talents Program of China.

Naifu Peng
Peking Univ

Date submitted: 26 Jul 2016 Electronic form version 1.4