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Statistics for One-dimensional Compressible Turbulence with Large-scale Forcing QIONGLIN NI, SHIYI CHEN, SKLTCS, CAPT and HEDPS, College of Engineering, Peking University — A numerical study was performed to explore the difference between the one-dimensional hydrodynamic compressible turbulence and Burgers turbulence. The compressible flows were simulated at three different turbulent Mach numbers (M_t): 0.1, 1.0 and 3.2 using a large-scale random forcing scheme. We observed that the isentropic condition was approximately valid in the $M_t = 1.0$ case, and its statistical scalings were close to those in the Burgers equation. We then used the subensemble method to decompose the velocity field of the flow into two subensembles, according to the local energy fluxes in the positive and negative directions, respectively, and found that the subensemble probabilities were scale invariant in the inertial range. Further investigation revealed that the corresponding transition process between two subensembles in the compressible turbulence, unlike its Markovian counterpart in the Burgers turbulence, was not in accordance with a Markov process.

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