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**On the cascade of kinetic energy in three-dimensional compressible turbulence** JIANCHUN WANG, YANTAO YANG, YIPENG SHI, ZUOLI XIAO, XIANTU HE, SHIYI CHEN, Peking University — A high resolution numerical simulation of three-dimensional compressible turbulence with large scale forcing is performed to study the kinetic energy transfer. In particular, the forcing scheme is designed to control the ratio of energy input from the solenoidal and compressive velocity components. Numerical simulation reveals that the compressive component of the density-weighted velocity has major contribution to the kinetic energy flux, due to the presence of large-scale shocks. Using a "coarse-graining" approach, we further show that the kinetic energy flux from both solenoidal and compressive components are nearly constant over the inertial range. However, the cascade rate of compressive mode is much faster than that of solenoidal mode, leading to the dominant of solenoidal kinetic energy over its compressive counterpart at high wavenumbers. We argue that this difference between the energy transfer rates is the major physical reason why the energy spectrum in the compressible turbulence always displays the Kolmogorov's -5/3 scaling in the inertial range, a phenomenon of incompressible turbulence.

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