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Kinetic energy transfer in compressible anisotropic homogeneous turbulence. XIAONING WANG, JIANCHUN WANG, SHIYI CHEN, Department of Mechanics and Aerospace Engineering, SUSTech, HUI LI, School of Power and Mechanical Engineering, Wuhan University — Kinetic energy transfer in compressible anisotropic homogeneous turbulence is studied using numerical simulations, including turbulence in periodic box with large-scale anisotropic forcing and homogeneous shear turbulence. First, inter-scale energy transfer and inter-component energy transfer are investigated using a filtering approach. At large scales, the subgrid-scale (SGS) flux of kinetic energy is anisotropic and dominated by streamwise component. As turbulent Mach number increases, the direct SGS flux of kinetic energy is suppressed by expansion motions and enhanced by compressible motions, while the reverse SGS flux is enhanced by expansion motions and suppressed by compressible motions. The pressure–strain components mainly transfer energy from the streamwise direction to transverse direction. Meanwhile, using Helmholtz decomposition, it is found that kinetic energy is transferred from solenoidal mode to compressible mode by the nonlinear advection term which increases with turbulent Mach number in anisotropic turbulence in periodic box, and decreases with turbulent Mach number in homogeneous shear turbulence. This indicates that the uniform mean shear suppressions the exchange of kinetic energy between solenoidal mode and compressible mode.

Xiaoning Wang
Department of Mechanics and Aerospace Engineering, SUSTech

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