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Direct numerical simulation of compressible Kolmogorov flow REBECCA BERTSCH, SHARATH GIRIMAJI, GAURAV KUMAR, Texas A&M University — Direct numerical simulations to investigate three-dimensional compressible turbulent Kolmogorov flow using the gas kinetic method are performed. The evolutions of single modes in isolation are examined in order to gain insight into the evolution of statistics of modes in collection. Single modes, or straight modes, are either stream-wise or span-wise and their combinations refer to oblique modes. Oblique modes (initially two-dimensional) are analyzed to isolate unstable modes and study the effect of gradient Mach number and Taylor-microscale Reynolds number. The competition between the Kelvin-Helmholtz and uniform shear instability is observed to determine the effect on flow-thermodynamic interactions. Simulations of turbulent Kolmogorov flow with varying amount of compressibility, determined by the gradient Mach number, are analyzed to support prior results of the stabilizing effect of compressibility in turbulent shear flows.

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