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Reynolds and Mach number scaling in compressible isotropic turbulence[1] SHRIRAM JAGANNATHAN, DIEGO DONZIS, Texas A&M University — A large database of well-resolved Direct Numerical Simulations of forced compressible isotropic turbulence, including recent simulations at 2048^3, with Taylor Reynolds numbers up to 400, and a range of Mach numbers (M_t) is used to investigate Reynolds and Mach number effects in compressible turbulence. The spectrum of dilatational energy is greatly affected by compressibility, unlike the solenoidal part. The density spectrum shows an incipient $k^{-5/3}$ at high Reynolds whose height increases with M_t. The scaling of dissipation and pressure-dilatation, the two exchange mechanisms between kinetic and internal energy, are also investigated. While the dilatational dissipation scales as M_t^2 at low Mach numbers, a stronger effect is observed at high M_t. Although the mean pressure-dilatation, which scales with dilatational dissipation, is small compared to the total dissipation for low Mach numbers, at high Mach numbers it is comparable to the total dissipation. The probability density function of pressure-dilatation shows fluctuations greater than O(100) times the mean indicating localized but strong positive and negative transfers which tend to give only a small net contribution when averaged over space. This effect increases at high Reynolds and low Mach numbers.

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