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Small-scale intermittency in compressible turbulence DIEGO DONZIS, SHRIRAM JAGANNATHAN, Texas A&M University — While the effects of compressibility on low-order quantities such as the mean turbulent kinetic energy and dissipation in decaying turbulence have been extensively investigated, little is known about the scaling of fine intermittent structures and how they scale with Reynolds and turbulent Mach numbers. It is thus unclear how the intermittent behavior of energy dissipation rate, for example, in compressible flows compares with its incompressible counterpart. Massive direct numerical simulations of isotropic compressible turbulence at finer-than-usual grid resolutions were conducted to investigate the scaling of small-scale intermittency at a range of Reynolds and turbulent Mach numbers. Large-scale forcing is applied to attain a stationary state which permits better statistical sampling of intermittent activity and, at the same time, provides results independent of initial conditions. Scaling exponents for energy dissipation rate are computed and compared to theoretical models. While low-order moments of dissipation show weak dependence on compressibility levels and thus possess scaling exponents similar to the incompressible case, high-order moments depend on the turbulent Mach number. Differences in the scaling of solenoidal and dilatational components are related to the structure of the most intense events for each type of motion. The consequences of the finidings are discussed in the context of high Reynolds number flows.

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