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The role of compressions and expansions in stationary compressible isotropic turbulence SHRIRAM JAGANNATHAN, DIEGO DONZIS, Texas A&M University — A characteristic of turbulence that is unique to compressible flows is the presence of compressing and expanding fluid regions that correspond to negative and positive values of dilatation respectively. While considerable attention has been given to studying the role of compressions, the effect of expansions has not been investigated in any detail. We employ a large database of Direct Numerical Simulation of stationary compressible isotropic turbulence at Taylor Reynolds numbers up to 450 and a range of Mach numbers ($M_t \approx 0.1 - 0.6$) to examine the impact of compressions and expansions on the statistics of thermodynamic variables. Our results indicate that expansions affect the flow thermodynamics more significantly than equally strong compressions. While at low M_t thermodynamic variables are less likely to be affected by compressions and expansions, they tend to be altered significantly by expansions at high M_t. Expansions are less likely to appear as compared to compressions, but tend to produce an increase in the correlation between density and temperature at high M_t, which, as will be shown, affects the pressure fluctuations. The differences in flow statistics in regions of intense fluctuations for low and high M_t will also be discussed.

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