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Reynolds Stress Anisotropy and Vortex Structures in Compressible Homogeneous Turbulent Shear Flow VAIBHAV BHUTORIA, GREGORY BLAISDELL, MUKUL RAO, Purdue University — Direct numerical simulations of compressible homogeneous shear flow using natural initial conditions are performed for a range of gradient and turbulent Mach numbers. A pseudo-spectral Fourier collocation method is used to perform the simulations. Compressibility effects result in a reduced growth rate of turbulent kinetic energy, predominantly through a reduced production rate. This is found to be parameterized better by the gradient Mach number than by the turbulent Mach number. From the Reynolds stress anisotropy tensor it is found that the reduced production rate is due to lower energy in the velocity fluctuations in the direction of the mean velocity gradient. Lumley's tensor invariant map shows that more compressible flows tend towards the 1-component turbulence state. High speed and low speed streaks associated with corrugated vortex sheets are found in these simulations. The mechanism of formation of the corrugated vortex sheets is investigated.

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