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Stabilizing effect of compressibility in high-Mach number turbulence: One possible explanation SHARATH S. GIRIMAJI, Texas A&M University — In high gradient Mach number mixing layers, it is generally accepted that compressibility effects lead to reduced levels of kinetic energy and lower levels of mixing (the so-called Langley curve). It has been pointed out by several authors (Sarkar, 1995) that the physical mechanism responsible for the reduction is also present in homogeneous shear turbulence. In an attempt to study this mechanism in isolation, we perform rapid distortion analysis of homogeneous flow subject to large strain. The investigation reveals that several regimes of turbulence behavior are possible depending on the gradient Mach number. In some regimes, the turbulence levels are higher than in comparable incompressible flow. The stabilizing regime is also identified. In this talk we will discuss the underlying physics of stabilizing and destabilizing regimes and present a simple dynamical model that captures the quintessential aspects of the observed behavior.

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