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Flow-thermodynamics interactions in compressible shear-driven turbulence: Linear analysis of possible flow control strategies REBECCA BERTSCH, GAURAV KUMAR, SHARATH GIRIMAJI, Texas A&M University — Flow-thermodynamics interaction in turbulent flows can be classified into three categories based on the action of pressure fluctuations. In very high Mach number flows, pressure fluctuations play an insignificant role as momentum far exceeds pressure forces. At very low Mach numbers, pressure is determined by the Poisson equation and flow-thermodynamics interactions are dynamically not very important. However, at intermediate Mach numbers, pressure exhibits wave character leading to critical flow-thermodynamics interactions and concurrent modification in the nature of turbulence. In our previous works, we have established that inhibiting influence of compressibility on turbulence is due to the intermediate Mach number regime. In this work, we use RDT (rapid distortion theory) linear equations to examine some strategies for flow control in the intermediate Mach number regime by exploiting flow-thermodynamic interactions. The results have important implications for inhibiting onset of turbulence in hypersonic external flows and intensifying mixing in internal propulsion flows.

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