Abstract Submitted
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A numerical study of turbulence under time-dependent axisymmetric contraction and subsequent relaxation[1] M.P. CLAY, P.K YEUNG, Georgia Tech, Z. WARHAFT, Cornell Univ. — Turbulence subjected to axisymmetric strain is a fundamental problem which is common in engineering equipment with variable cross-section, but is not yet fully understood. We have performed direct numerical simulations on a deforming domain with grids up to 1024^3 and a time-dependent strain history designed to mimic spatial gradients in wind-tunnel experiments (Ayyalasomayajula & Warhaft *J. Fluid Mech.* **566**, 273-307 (2006)). Isotropic turbulence with a specified energy spectrum is allowed to decay and then passed through a numerical conduit of 4:1 contraction ratio. The Reynolds stress tensor, velocity gradient variances, and longitudinal and transverse one-dimensional (1D) spectra are studied during both the contraction and subsequent relaxation. Contraction leads to amplification of energy in the compressed directions and departures from local isotropy. When the strain is removed local isotropy returns quickly while the energy decays with a power law exponent smaller than for decaying isotropic turbulence. The evolution of 1D spectra including changes in shape is consistent with experiments, but a large solution domain is important.

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