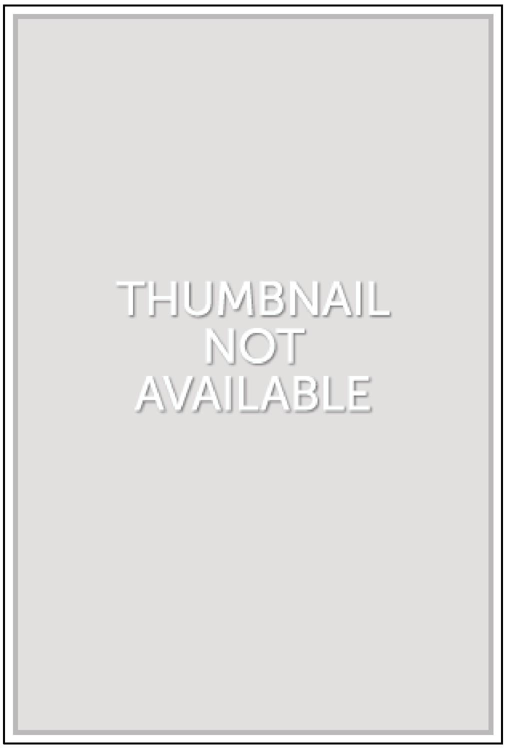
Numerical Simulation of Shock/Turbulent Boundary Layer Interaction (Paperback)



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NUMERICAL SIMULATION OF SHOCK/TURBULENT BOUNDARY LAYER INTERACTION (PAPERBACK)

Independently Published, United States, 2018. Paperback. Condition: New. Language: English. Brand new Book. Most flows of aerodynamic interest are compressible and turbulent. However, our present knowledge on the structures and mechanisms of turbulence is mostly based on incompressible flows. In the present work, compressibility effects in turbulent, high-speed, boundary layer flows are systematically investigated using the Direct Numerical Simulation (DNS) approach. Three-dimensional, time-dependent, fully nonlinear, compressible Navier-Stokes equations were numerically integrated by high-order finite-difference methods; no modeling for turbulence is used during the solution because the available resolution is sufficient to capture the relevant scales. The boundary layer problem deals with fully-turbulent compressible flows over flat geometries. Apart from its practical relevance to technological flows, turbulent compressible boundary layer flow is the simplest experimentally realizable turbulent compressible flow. Still, measuring difficulties prohibit a detailed experimental description of the flow, especially in the near-wall region. DNS studies provide a viable means to probe the physics of compressible turbulence in this region. The focus of this work is to explore the paths of energy transfer through which compressible turbulence is sustained. The structural similarities and differences between the incompressible and compressible turbulence are also investigated. The energy flow patterns or energy cascades are found to be directly related to the evolution of vortical structures which are generated in the near-wall region. Near-wall structures, and mechanisms which are not readily accessible through physical experiments are analyzed and their critical role on the evolution and the behavior of the flow is documented extensively. Biringen, Sedat and Hatay, Ferhat F. Unspecified Center NAG1-1472.

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