



Compressibility, Turbulence and High Speed Flow

Thomas B. Gatski, Jean-Paul Bonnet

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This book introduces the reader to the field of compressible turbulence and compressible turbulent flows across a broad speed range through a unique complimentary treatment of both the theoretical foundations and the measurement and analysis tools currently used. For the computation of turbulent compressible flows, current methods of averaging and filtering are presented so that the reader is exposed to a consistent development of applicable equation sets for both the mean or resolved fields as well as the transport equations for the turbulent stress field. For the measurement of turbulent compressible flows, current techniques ranging from hot-wire anemometry to PIV are evaluated and limitations assessed. Characterizing dynamic features of free shear flows, including jets, mixing layers and wakes, and wall-bounded flows, including shock-turbulence and shock boundary-layer interactions, obtained from computations, experiments and simulations are discussed.

Key features:

- * Describes prediction methodologies including the Reynolds-averaged Navier Stokes (RANS) method, scale filtered methods and direct numerical simulation (DNS)
- * Presents current measurement and data analysis techniques
- * Discusses the linkage between experimental and computational results necessary for validation of numerical predictions
- * Meshes the varied results of computational and experimental studies in both free and wall-bounded flows to provide an overall current view of the field

Dr. Gatski has been involved in turbulent flow research for over 25 years, primarily in the development and application of turbulent models to aerodynamic flows. He has edited books and published extensively in the field, and now serves as an Editor-in-Chief for the International Journal of Heat and Fluid Flow.

Dr. Bonnet has worked on experimental research in compressible turbulence in supersonic flows since the early 1980s. He is a member of the Editorial Board of the International Journal of Heat and Fluid Flow and the ERCOFTAC Special Interest Group on turbulence in compressible flows.

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