

Abstract Submitted
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Turbulence in an inhomogeneous medium ROBERT RUBINSTEIN,
NASA Langley Research Center — In some compressible turbulent flows, it is appropriate to assume that density fluctuations are negligible. The additional assumption that the mean density is known independently of the velocity field defines a model problem of turbulent fluctuations in an inhomogeneous medium in which the solenoidal condition on velocity of the constant density case is replaced by a solenoidal condition on the product of density and velocity. Because the fluctuations are inhomogeneous, the correlation function is not diagonal in the Fourier representation. Closure theories for this problem will be formulated and applied to analyze the possibility of inhomogeneous steady states and the applicability of gradient transport models. A generalized self-similarity for variable density will be developed and applied to the compressible law of the wall for boundary layers at moderate Mach numbers. Implications of the breakdown of this type of self-similarity as Mach number is increased will be drawn for understanding the behavior of cold-wall boundary layers.

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