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Statistical model for turbulent transition by variable-density pressure-gradient-driven mixing[1] J. BAKOSI, J.R. RISTORCELLI, Los Alamos National Laboratory — A Monte-Carlo method for variable-density (VD) pressure-gradient-driven turbulence has been developed. VD effects due to non-uniform mass concentrations (e.g. mixing of different-density species) are considered. The model numerically computes the full time-evolution of the joint probability density function (PDF) of fluid density and velocity in a non-stationary Rayleigh-Taylor flow, that develops from quiescent state to a laminar stage, through transition to fully developed turbulence and dissipative decay. The coupled model for hydrodynamics and mixing is designed for arbitrary Atwood numbers. The main characteristics of the method are: (1) It eliminates the need for quasi-equilibrium assumptions, gradient diffusion hypotheses, modeling of the mass flux and of the density-specific-volume covariance; (2) The mixing state is represented by the density PDF; (3) It captures the density skewness, due to large differential accelerations of different-density species; and (4) It represents both small and large scale anisotropy.

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