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Dissipative Dynamics of Turbulent Kinetic Energy and Density Variance in Rayleigh-Taylor Instability-Induced Mixing and Application to Turbulence Modeling[1] OLEG SCHILLING, Lawrence Livermore National Laboratory, NICHOLAS MUESCHKE, Texas A&M University — The dynamics of the density variance, turbulent kinetic energy dissipation rate, and density variance dissipation rate are examined in the context of turbulent Rayleigh-Taylor mixing. Mean and fluctuating fields from a $1152 \times 720 \times 1280$ direct numerical simulation of a small Atwood number Rayleigh-Taylor mixing layer are used to construct the unclosed terms in the corresponding transport equations. The gradient- diffusion and scale-similarity approximations used to close these equations are tested by comparing the profiles of the terms in the unclosed transport equations a priori with the corresponding profiles of the modeled terms. Optimized model parameters yielding good agreement between the unclosed terms and their models are determined. Implications for turbulent transport modeling of Rayleigh-Taylor instability-induced mixing are discussed.

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