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A Posteriori Tests of a Three- and Four-Equation Advanced Reynolds–Averaged Navier–Stokes Model for Rayleigh–Taylor Turbulent Mixing[1] GREGORY BURTON, OLEG SCHILLING, Lawrence Livermore National Laboratory — A high-order, multicomponent implementation of a three- and four-equation, variable-density incompressible Reynolds-averaged Navier-Stokes model incorporating both mechanical and scalar turbulence is used to simulate Rayleigh-Taylor turbulent mixing with an Atwood number equal to one-half. The closures in this model were previously tested a priori against the large Reynolds number 3072^3 Cabot-Cook direct numerical simulation (DNS) data over the entire evolution of the flow into the late-time self-similar regime. Using both Reynolds number-dependent and late-time coefficients obtained by minimizing the L^2 norm between the model and DNS data, the predicted mixing layer evolution is compared with both the averaged DNS data and analytical self-similar solutions of the transport equations. The terms in the transport equation budgets are compared in detail to their profiles across the mixing layer predicted by the DNS. The implications of these results for advanced modeling of Rayleigh-Taylor turbulent mixing are discussed.

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