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A Posteriori Tests of an A Priori Optimized Turbulence Model for Small and Large Schmidt Number Rayleigh-Taylor Mixing[1] NICHOLAS J. MUESCHKE[2], Texas A&M University, OLEG SCHILLING, Lawrence Livermore National Laboratory — Data from a $1152 \times 720 \times 1280$ direct numerical simulation (DNS) of a buoyancy-driven hot/cold water channel experiment is used to construct an optimized four-equation turbulence model for Rayleigh–Taylor mixing. The transport equations for the turbulent kinetic energy and its dissipation rate and of mass fraction variance and its dissipation rate are closed a priori by minimizing the L_2-norm between the exact unclosed terms and their gradient-diffusion or scale-similarity closures. The model is tested a posteriori by applying the model to both the $Sc = 7$ hot/cold water experiment and to a $Sc \sim 10^3$ salt/fresh water experiment. It is shown that the mixing layer growth and molecular mixing parameters measured from both experiments are well-predicted by the model. The dependence of the predictions on different initialization times of the model, as well on choosing constant late-time values of the parameters (rather than Reynolds number-dependent parameters), are discussed.

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