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Rayleigh-Taylor turbulent mixing of immiscible, miscible and stratified fluids SNEZHANA I. ABARZHI, Center for Turbulence Research, Stanford, ANDREY GOROBETS, International Center for Theoretical Physics, Trieste, Italy, KATEPALLI R. SREENIVASAN, International Center for Theoretical Physics, Trieste, Italy — We present a heuristic model describing the Rayleigh-Taylor(RT) turbulent mixing of immiscible, miscible, and stratified fluids. The model does not presume a single-scale character of the interface dynamics and distinguishes between the evolution of horizontal and vertical scales. For fluids with constant densities, the results obtained indicate two distinct mechanisms for the mixing development. The former is the traditional merge associated with the growth of horizontal scales. The latter is associated with the production of small- scale structures and with the growth of the vertical scale, which plays the role of the integral scale for energy dissipation. In RT mixing, the rate of momentum loss is the flow invariant, whereas the energy dissipation rate is not, and the fundamental scaling properties of the accelerated flow differ from those of the classical Kolmogorov turbulence. The model considers the influence of turbulent diffusion and stratification on mixing process. We show that turbulent diffusion calculated through temperature fluctuations does not stop mixing, but decreases its growth-rate significantly, makes it time-dependent and sensitive to the initial conditions. In a stratified density profile, the mixing process is terminated.

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