**Stochastic modeling of statistically unsteady turbulent mixing**[1]

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Rayleigh-Taylor and Richtmyer-Meshkov turbulent mixing are statistically unsteady processes. Their dynamics combines coherence and randomness, and their mean values and fluctuations are both time-dependent. These turbulent processes have a number of symmetries and are characterized by a set of invariant measures [EPL 91, 12867]. Employing these invariant measures, we developed a stochastic model for Rayleigh-Taylor and Richtmyer-Meshkov turbulent mixing in the case of sustained, time-dependent and impulsive acceleration. For the flow quantities, the effect of fluctuations on the mean values is studied and their statistical properties are analyzed. Requirements for statistical quality of experimental and numerical data are outlined. Mechanisms of mitigation and control of turbulent mixing processes are proposed. Their implementation in high energy density plasmas experiments is discussed.

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