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Turbulent/non-turbulent interface in flows affected by Rayleigh-Taylor instability PRASOON SUCHANDRA, Georgia Institute of Technology, MARK MIKHAEIL, Exxon Mobil Corporation, GOKUL PATHIKONDA, DEVESH RANJAN, Georgia Institute of Technology — Simultaneous velocity-density measurements (PIV/LIF) are used to study turbulent/non-turbulent interface (TNTI) in flows affected by Rayleigh-Taylor Instability (RTI). Experiments are conducted in a gas tunnel facility with air as heavy fluid and helium+nitrogen mixture as light fluid giving Atwood number ˜0.1. The nature of the TNTI on bubble front, as well as the change in mean and turbulent quantities across this TNTI are investigated. The molecular mixing is also studied relative to the TNTI. The TNTI shows a complex conditionally averaged volume fraction profile in its vicinity. In the external layer, the fluid is mostly pure heavy fluid, leading to no concentration gradients and a nearly zero measurement of the scalar dissipation. At the interface, there is a very large magnitude of scalar dissipation. In the adjustment layer, the scalar dissipation is nearly constant. These results challenge the conventional shape of profiles of turbulent quantities in RTI flows which are typically assumed parabolic. A better way to interpret the variation of turbulent quantities across the mixing width is to assume them to be nearly uniform in the core of the flow and be modulated by the location of the TNTI. If a stochastic model for the variation of the TNTI could be found which also described the value of these turbulence parameters in the core, the description of the RTI flow could be simplified to only be determined by values at a single point in the core and knowledge about the TNTI location.

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