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Density Effects on Incompressible Shear-Driven Mixing Layer Growth JON BALTZER, DANIEL LIVESCU, Los Alamos National Laboratory — Our preliminary simulations of shear-driven turbulent mixing layers involving two streams of fluids with different densities have revealed that the growth rates of mixing layer thickness are reduced when the density difference is increased, even in the absence of high-speed effects. To assess a wide range of densities, we have performed a suite of incompressible temporal Direct Numerical Simulations involving two miscible fluids, with Atwood numbers of up to 0.87. Large domains involving up to 6144 x 2048 x 1536 points provide accurate statistics of growth and budgets. For the variable density case, there is no unique definition of the layer thickness (e.g., momentum thickness may defined traditionally or on a per-mass basis). Yet, the thickness definition used can substantially affect the growth rate change due to density effects. We analyze the equations describing the growth rates and relate density effects to asymmetries that develop in the flow with increasing Atwood number. Most importantly, mixing layers are found to grow preferentially towards the lower-density stream, which has significant implications for the momentum balance.

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