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Local absolute instability in the near field of hot and light round jets WILFRIED COENEN, ALEJANDRO SEVILLA, Area de Mecanica de Fluidos, Universidad Carlos III de Madrid — We present a numerical investigation of the viscous spatiotemporal stability properties of low-density round jets emerging from circular nozzles or tubes. The two particular cases typically studied in experiments, namely a hot gas jet discharging into a quiescent cold ambient of the same species, and an isothermal jet consisting of a mixture between two gases with different molecular weight, discharging into a stagnant ambient of the heavier species, are treated separately. We use a realistic representation of the base velocity and density profiles based on boundary layer theory, taking into account the effect of variable transport properties. Our results show significant quantitative differences with respect to previous studies that use parametric presumed-shape base profiles, and reveal that hot jets are generically more unstable than light jets. In addition, the downstream evolution of the local stability properties of the jet is analyzed, revealing that, whereas a localized pocket of absolute instability can take place in the jet, for the combination of jet-to-ambient density ratio, Reynolds number, and initial momentum thickness used in experiments available in the literature, the absolutely unstable region in the jet is bounded by the jet outlet. The global transition observed in these experiments is demonstrated to take place when the absolutely unstable domain becomes sufficiently large.

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