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Linear Stability Analysis of a Variable-Density Jet GREGORY RODEBAUGH, LESTER SU, Johns Hopkins University — We investigate the instability properties of an incompressible, variable-density, axisymmetric jet. While there has been considerable interest in the role of density on stability properties, prior analyses typically rely on the Boussinesq approximation. Our study is not restricted by the use of this approximation, thereby allowing a full range of density profiles to be examined. Retaining density effects in the inertial terms allows consideration of realistic density profiles, incorporating large density variations, such as might occur in reacting flow systems. The jets in question here are nominally momentum-driven, and the imposed disturbances are spatially developing. Initial results show that the modification of the linear stability properties of the flow due to the density variations primarily arises in the inertial terms, rather than the buoyancy terms. We also make qualitative comparisons of the instability properties of the flow, determined numerically, with flow visualization results in the near-field of uniform-density and variable-density jets in the laboratory.

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