Abstract Submitted
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Absolute Instability of a Variable Visccosity Jet VINOD SRINIVASAN, Indian Inst of Science — The linear stability of an incompressible jet issuing into an ambient of higher viscosity is examined. Motivated by experimental results, only axisymmetric disturbances are considered. It is shown that for a constant-density jet with a prescribed velocity profile and Reynolds number, there exists a critical viscosity ratio between the jet centerline and far-field values, at which the jet transitions from convective to absolute instability. The axial disturbance corresponding to absolute instability is similar to the "column" mode found in the absolute instability of low-density jets. The boundary between absolute and convective instability is tracked as a function of viscosity ratio, Reynolds number, jet shear layer thickness, and density ratio. Shadowgraph and schlieren visualization is performed for a hot water jets issuing into a cold medium, over an experimental parameter range suggested by linear theory. A sudden increase in the jet spreading angle is interpreted as the onset of a global mode; hot film anemometry measurements corroborate the hypothesis. Global modes are observed for sufficiently large viscosity ratios. The onset and disappearance of global modes qualitatively matches the predictions of linear theory.

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