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Are Low Viscosity Jets Globally Unstable AKASH DHOTRE, VINOD SRINIVASAN, University of Minnesota, Twin Cities — Many studies on stability in variable low-density jets exhibit the existence of instabilities that may lead to self-sustained oscillations. However, most studies neglect viscous effects, which are also found to dramatically alter the flow stability. Hence, experiments are performed with a low viscosity, density-matched jet introduced into a more viscous ambient. A study of instability and the subsequent breakdown of an axisymmetric jet with a jet-to-ambient viscosity ratio, M, ranging from 1 to 40 has been carried out for jet Reynolds number ranging from 400 to 2500. Flow visualization results indicate that viscosity stratification influences the growth rate and favors the growth of helical modes. A sharp peak in the hotwire spectra indicates the existence of a single-mode present in the near field of the jet, which is a weak function of the Reynolds number. The self-excited frequency of the jet appears to increase with increasing M. The response of the jet to external forcing using an acoustic driver is studied and it is observed that the self-excited nature of the jet can be modified by a forcing frequency allowing for controlled mixing.

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