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**Instability in viscosity-stratified free shear layer** KIRTI SAHU, Department of Chemical Engineering, Indian Institute of Technology Hyderabad, Yeddumailaram 502 205, India, RAMA GOVINDARAJAN, TIFR Centre for Interdisciplinary Sciences, Tata Institute of Fundamental Research Narsingi, Hyderabad 500075, India — The stability of a mixing layer made up of two miscible fluids, with a viscosity-stratified layer between them, is studied. The two fluids are of the same density. It is shown that unlike other viscosity stratified shear flows, where species diffusivity is a dominant factor determining stability, species diffusivity variations over orders of magnitude do not change the answer to any noticeable degree in this case. Viscosity stratification, however, does matter, and can stabilize or destabilize the flow, depending on whether the layer of varying velocity is located within the less or more viscous fluid. This flow is thus a prototype for a situation where viscosity stratification acts on the stability by an inviscid mechanism. This is confirmed by making an inviscid model flow with a slope change across the “viscosity” interface. The absolute instability of the flow can also be significantly altered by viscosity stratification.

Kirti Sahu  
Dept of Chemical Engineering, Indian Institute of Technology Hyderabad,  
Yeddumailaram 502 205, India

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