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Linear stability of double-diffusive two-fluid channel flow KIRTI

SAHU, Department of Chemical Engineering, Indian Institute of Technology Hyderabad, Yeddumailaram 502 205, Andhra Pradesh, India, RAMA GOVINDARAJAN, Centre for Interdisciplinary Sciences, Tata Institute of Fundamental Research, Hyderabad, India — Double-diffusive density stratified systems are well studied and shown to display a rich variety of instability behaviour. However double diffusive systems where the inhomogeneities in solute concentration are manifested in terms of stratified viscosity rather than density have been studied far less, and not to our knowledge in high Reynolds number shear flows. In a simple geometry, namely the two-fluid channel flow of such a system, we find a new double-diffusive mode of instability. The instability becomes stronger as the ratio of diffusivities of the two scalars increases, even in a situation where the net Schmidt number decreases. The double-diffusive mode is destabilised when the layer of viscosity stratification overlaps with the critical layer of the perturbation.

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