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Early stages of transition in viscosity-stratified channel flow RAMA GOVINDARAJAN, SHARATH JOSE, Tata Institute of Fundamental Research, Hyderabad, LUCA BRANDT, KTH Mechanics, Stockholm — In parallel shear flows, it is well known that transition to turbulence usually occurs through a subcritical process. In this work we consider a flow through a channel across which there is a linear temperature variation. The temperature gradient leads to a viscosity variation across the channel. A large body of work has been done in the linear regime for this problem, and it has been seen that viscosity stratification can lead to considerable changes in stability and transient growth characteristics. Moreover contradictory effects of introducing a non uniform viscosity in the system have been reported. We conduct a linear stability analysis and direct numerical simulations (DNS) for this system. We show that the optimal initial structures in the viscosity-stratified case, unlike in unstratified flow, do not span the width of the channel, but are focussed near one wall. The nonlinear consequences of the localisation of the structures will be discussed.

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