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Stability characteristics of a rotating Poiseuille flow about the streamwise axis JEAN-PIERRE HICKEY, Royal Military College of Canada, GEORGE KHUJADZE, MARTIN OBERLACK, TU-Darmstadt — A more complete understanding of transition to turbulence in a Poiseuille flow rotating about the streamwise axis is sought by studying the stability of the flow. Using the classical theory of modal analysis, the stability characteristics of this flow setup are investigated. We find that the addition of the Coriolis force significantly increases the growth rates achieved compared to the non-rotating channel flow until a certain point, after which the high Rossby numbers stabilize the flow. Given the non-normality of the equations governing the flow, we investigate the transient energy growth. We show that the energetic growth can be, as in the non-rotating case, of the order of $O\left(10^3\right)$ and that the maximal growth is caused by disturbances nearly perpendicular to the main flow. The maximal growth is achieved by crosswise perturbations until the point of alpha transition, after which the maximal growth is created by an oblique disturbance. The induced crosswise double-S velocity profile found in previous investigations is explained by the optimal initial disturbances leading to this maximal growth.

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