

Abstract Submitted
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Secondary instability in pipe flow: optimal non-axisymmetric base-flow deviations GUY BEN-DOV, JACOB COHEN, Faculty of Aerospace Engineering, Technion, Haifa — The temporal growth of disturbances developing in pipe Poiseuille flow, which has been modified by primary helical axially-independent finite-amplitude initial disturbances, is analyzed. Such finite disturbances in the developed parabolic profile may occur as a result of transient growth amplifications. The optimal modification is defined as the primary non-axisymmetric base-flow deviation, with a specific amplitude norm, that yields the maximum growth rate for the secondary disturbances. Optimal modifications are computed by a variational technique. Unstable modes are found to exist for very small values of the primary disturbances amplitudes at relatively small Reynolds numbers. The optimal base-flow deviations are localized in a narrow radial range, implying that an inviscid instability mechanism is responsible for the evolution of the secondary disturbances.

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