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Effect of Axially-Periodic Pipe Radius on the Linear Stability of Circular Poiseuille Flow D.L. COTRELL, G.B. MCFADDEN, NIST, W.E. ALLEY, B.J. ALDER, LLNL — We report linear stability results for flow driven by an axial pressure gradient in an axisymmetric pipe with axially-periodic radius. We assume that the base flow is steady, axisymmetric, axially-periodic with the forcing wavelength, and that there is no azimuthal velocity component. In these computations, we use finite-element methods for the base flow and stability problems, account for arbitrary disturbances of infinitesimal amplitude, and show that the critical disturbance has non-zero frequency and is of different axial wavenumber than the wall forcing. Results show that neutral curves can be strongly bi-modal, and that this bi-modal nature results in the critical axial wavenumber and wavespeed having two disjoint ranges of forcing amplitude where critical values vary only slightly (i.e., a low and high plateau). On the other hand, the critical Reynolds number is monotonically increasing as one decreases the forcing amplitude.

David Cotrell
NIST

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