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Biglobal stability of vortex rings NAVEEN BALAKRISHNA, JOSEPH MATHEW, ARNAB SAMANTA, Indian Inst of Science — Shear layers of low-speed round jets are known to roll up via Kelvin-Helmholtz-like instability into vortex rings, which are then susceptible to azimuthal instability. Using an inviscid linear stability analysis, Widnall and Tsai (1977) found for a thin vortex ring the most unstable azimuthal mode to depend upon the core to ring radius ratio and the core vorticity distribution. In addition, the outside straining field deforms this ring core into the shape of an ellipse. In this work, both the azimuthal and elliptic instabilities are investigated using a linear biglobal stability framework. It is formulated as a standard eigensystem in cylindrical polar coordinates with Fourier decomposition along the azimuthal direction, while Chebyshev collocation points are used in other directions. We explore the role of viscosity on instability, which has not been studied before in detail.

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