Abstract Submitted
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Optimal disturbances in shearing and swirling flows[1] CONOR DALY, University of Cambridge — Over the past twenty years transient energy density growth of linearly stable disturbances has shown to be the likely instigator for transition to turbulence in parallel shear flows. In this vein, optimal linear perturbations are calculated for two flows which have a mixture of forces acting on the fluid body. These are; rotating plane Couette flow (RPCF), which combines pressure-driven shear and swirl, and cylindrical Couette-Poiseuille flow (CCPF), which combines pressure-driven and Couette shear. Contours are presented of the maximum achievable linear transient growth, G, over the full range of wavenumbers within the linearly stable parameter regimes. Reference is made to experimental works on each flow and we examine the role that optimal disturbances have in the different transition phenomena that are observed. It is found that the contours of G fall qualitatively alongside the points of transition in the two flows, in support of the notion that large linear transient growth can act a precursor to transition. Despite the combination of effects acting on each fluid, transition in both flows falls in the range $10^2 < G < 10^{2.5}$ suggesting that in both flows the same mechanism may be at work.

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