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Influence of the inlet velocity profile on the flow stability in a 2D symmetric channel expansion ROBIN DEBUYSSCHRE, BART RIMEZ, Transfers, interfaces processes (ULB), LORENZO SICONOLFI, FRANOIS GALLAIRE, Laboratory of Fluid Mechanics and Instabilities (EPFL), BENOIT SCHEID, Transfers, interfaces processes (ULB) — In a channel flow with a sudden expansion, whether for 3D tubular flow, for 3D channel flow and for 2D planar flow, it is known that increasing the Reynolds number beyond a critical value Re_c induces a symmetry breaking Pitchfork bifurcation. The linear stability analysis of the symmetric steady solution enables to determine efficiently the Re_c and thus explore the influence of the expansion ratio (ER), the ratio between upstream and downstream diameter regarding the expansion. In this study, using linear stability analysis and direct numerical simulations, we investigate the behaviour of the flow after 2D sudden expansions while varying the ER and the inlet flow profile, e.g. transition profiles between plug and Poiseuille flow that could be reached for flow after a sudden constriction. Results demonstrate that imposing a plug flow at the inlet gives a higher Re_c than other profiles and that recirculation zones are shorter for a plug flow than for other profiles. We, then, show that these results can be rationalized using basic convection-diffusion arguments.

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