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Global linear stability analysis of separated flow over a rounded backward facing step OLIVIER MARQUET, MATTEO LOMBARDI, DENIS SIPP, ONERA/DAFE — The global linear stability of a two-dimensional flow over a rounded backward facing step to three-dimensional transverse perturbations is numerically investigated. The steady two- dimensional base flow is obtained from time-dependent simulations based on a finite-element spatial discretization and a Lagrange-Galerkin temporal discretization. The generalized eigenvalue problem is solved using the Implicity Restarted Arnoldi Method implemented in the ARPACK library. The most unstable linear mode is three-dimensional, non-oscillating and appears at a critical Reynolds number of Re=675. The associated eigenmode is localized within the separation bubble, and the reconstruction of the total flow shows a three- dimensional deformation of this recirculation region. The adjoint stability problem is solved in order to locate the core of the instability and to determine the influence of numerical boundary conditions on the direct stability problem. Our results suggest that the characteristics of the global mode are mainly dictated by the recirculation zone of the base flow.

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