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Three-dimensional stability by global modes in the flat plate boundary-layer flow ESPEN ÅKERVIK, LUCA BRANDT, DAN S. HENNINGSON, Linne Flow Centre, KTH Stockholm — The stability of the flat-plate boundary-layer flow is studied by means of three-dimensional eigenmodes of the linearized Navier–Stokes equations obtained by linearization about the steady state. The disturbance variables are approximated using a Fourier–Chebyshev collocation technique in inhomogeneous directions. Given the large size of the generalized eigenvalue problem we employ Arnoldi iterations using `ARPACK`. By expanding the flow disturbance variables in the basis of eigenmodes the growth potential is revealed by the computation of the optimal initial condition. This yields a low-dimensional model of the flow and a unified view on its stability characteristics. We discuss three different mechanisms associated with the non-normality of the operator: The *lift-up* mechanism is a componentwise non-normality where momentum is transferred from the spanwise to the streamwise velocity component. The *Orr* mechanism provides, through structures leaning against the shear, an efficient way of obtaining short time growth while borrowing energy from the mean flow, transferring momentum from the streamwise component to the wall-normal component. The *TS* mechanism is related to the streamwise non-normality where initial disturbances are located upstream and wavepacket propagation leads to a large energy gain downstream.

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