

Special Program in Applied Mathematics and Applied Mechanics

Spectra and pseudospectra for linear operators and its applications to flow instability and flow control

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Pseudospectral/resolvent analysis has become a widespread approach for analyzing/modeling turbulent fluid flows. Pseudospectral analysis is a powerful tool in characterizing behaviors of nonnormal linear operators, while their spectra/eigenvalues fails to capture dynamical behaviors such as transient growth and pseudoresonance. Nonnormality arises in a linear Navier--Stokes operator constructed about a base flow where shear is present. For this reason, pseudospectral analysis has been elegantly used to explain the 'subcritical' laminar-turbulent transition in Poiseuille flows while the eigenvalues of the linear Navier-Stokes operator all lie in the stable complex plane for a given Reynolds number.



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