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A wavepacket-based optimization method for resolvent analysis
BARBARA LOPEZ-DORIGA, SCOTT T. M. DAWSON, Illinois Institute of Technology — We report on the development of a semi-analytic method to approximate resolvent (pseudospectral) mode shapes and amplification levels. The method assumes that mode shapes can be accurately approximated by a sum of suitably-defined wavepackets. The small number of parameters prescribing the shape of these wavepackets may be found by solving a low-dimensional optimization problem, thus eliminating the need to form and decompose discretized linear operators. We demonstrate the applicability and assess the performance of this method on the Squire operator in laminar Couette and plane Poiseuille flow. In particular, we show that the method can be applied to cases where leading resolvent modes are affected by boundary conditions and/or multiple critical layers. We additionally explore the capabilities of this method to compute suboptimal mode shapes and amplification levels, and discuss prospects for applying this method to more complex systems.

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