Linking dissipation-induced instabilities with nonmodal growth: the case of helical magnetorotational instability

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The helical magnetorotational instability is known to work for resistive rotational flows with comparably steep negative or extremely steep positive shear. The corresponding lower and upper Liu limits of the shear are continuously connected when some axial electrical current is allowed to flow through the rotating fluid. Using a local approximation we demonstrate that the magnetohydrodynamic behavior of this dissipation-induced instability is intimately connected with the nonmodal growth and the pseudospectrum of the underlying purely hydrodynamic problem.