Spectral instability of a steady flow of an incompressible viscous fluid past a rotating obstacle

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Abstract

We show that a steady solution to the system of equations of motion of an incompressible Newtonian fluid past a rotating body is unstable if an associated linear operator $\mathcal{L}$ has a part of the spectrum in the right half-plane. The result does not directly follow from a series of preceding theorems on instability, mainly because the nonlinear term in the equation for perturbations is not bounded in the same space in which the instability is studied. As an important auxiliary result, we also show that the uniform growth bound of the C_0 semigroup, generated by operator $\mathcal{L}$, is equal to the spectral bound of $\mathcal{L}$

Keywords: incompressible fluid, spectral instability, C_0–semigroup