Stability of laminar flows in the presence of magnetic fields and possible applications

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Abstract

Laminar flows between parallel planes are a classical subject of fluid dynamics. The influence of a coplanar magnetic field was studied e.g. in [1, 2]. A nonlinear analysis of the system was first introduced by Rionero (see e.g. [3]). Recent works [4, 5] investigate the energy stability of the flow, proving that for some choices of boundary conditions and for some class of perturbations, stability depends solely on the magnetic Reynolds number. Xu and Lan show also that perturbations causing instability should be x-dependent (where x is the axis along the direction of the stationary flow).

The aim of this study is to establish some general properties of these flows, in particular the possible laminar stationary states and the validity of a Squire-like reduction of the dimensionality of the perturbations (see [6]).

A numerical analysis is then used to investigate the influence on linear stability of boundary conditions of the kinetic field and the magnetic field.
Some recent results (e.g. [7]) on the influence of magnetic fields on blood are reviewed. .

References

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