

# The Effect of a Magnetic Field Dependent Viscosity on the Thermal Convection in a Ferromagnetic Fluid in a Porous Medium

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The effect of the magnetic field dependent (MFD) viscosity on the thermal convection in a ferromagnetic fluid in the presence of a uniform vertical magnetic field is considered for a fluid layer in a porous medium, heated from below. For a ferromagnetic fluid layer between two free boundaries an exact solution is obtained, using a linear stability analysis. For the case of stationary convection, the medium permeability has a destabilizing effect, whereas the MFD viscosity has a stabilizing effect. In the absence of MFD viscosity, the destabilizing effect of magnetization is depicted, but in its presence the magnetization may have a destabilizing or stabilizing effect. The critical wave number and critical magnetic thermal Rayleigh number for the onset of instability is determined numerically for sufficiently large values of the magnetic parameter  $M_1$ . Graphs are plotted to depict the stability characteristics. The principle of exchange of stabilities is valid for a ferromagnetic fluid heated from below and saturating a porous medium.

*Key words:* Ferromagnetic Fluid; Magnetic Field Dependent Viscosity; Thermal Convection; Porous Medium; Vertical Magnetic Field.