

Stabilizing Effect of Magnetic Field in a Thermally Modulated Porous Layer

Authors : M. Meenasaranya, S. Saravanan

Abstract : Nonlinear stability analysis is carried out to determine the effect of surface temperature modulation in an infinite horizontal porous layer heated from below. The layer is saturated by an electrically conducting, viscous, incompressible and Newtonian fluid. The Brinkman model is used for momentum equation, and the Boussinesq approximation is invoked. The system is assumed to be bounded by rigid boundaries. The energy theory is implemented to find the global exponential stability region of the considered system. The results are analysed for arbitrary values of modulation frequency and amplitude. The existence of subcritical instability region is confirmed by comparing the obtained result with the known linear result. The vertical magnetic field is found to stabilize the system.

Keywords : Brinkman model, energy method, magnetic field, surface temperature modulation

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