

The Nonlinear Stability Analysis of Double Diffusive Convection with Viscous Dissipation and Internal Heat Source

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Abstract:

In this article, the non-linear stability analysis of double-diffusive convection in a horizontal fluid saturated porous layer is examined. The effects of viscous dissipation and internal heat source are considered in this problem. The boundary walls are assumed to be impermeable, isothermal and iso-solutal. The flow is modelled by the Darcy's law. The non-linear stability analysis has been implemented by the energy method. The eigenvalue problem is solved by using the Chebyshev tau method. The critical thermal Rayleigh number Ra_c is obtained for different flow governing parameters, solutal Rayleigh number Sa , Gebhart number Ge , Lewis number Le , internal heat source coefficient Q . From the numerical results, it is observed that the effect of viscous dissipation plays a major role in the stability of the system.

Keywords: Porous medium, double diffusive convection, viscous dissipation and internal heat source.