RBF Solution of MHD Convection Flow in a Lid-driven Cavity with an Obstacle

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Abstract

In this study, steady, laminar, fully developed flow of a viscous, incompressible, electrically conducting fluid is considered in a lid-driven cavity with a square obstacle under the influence of uniform magnetic field. The MHD convection equations are solved in terms of stream function, vorticity and temperature by using the radial basis function (RBF) approximation. The numerical results are obtained for several values of Grashof number (Gr) and Hartmann number (M) at a fixed Prandtl number ($Pr = 0.71$) and Reynolds number ($Re = 100$) with Eckert number ($Ec = 0$ or $Ec = 1$) to analyze the effect of buoyancy force, magnetic field and viscous dissipation on the flow and heat transfer. It is found that secondary flow occurs at the left part of the cavity as Gr increases. Viscous dissipation retards the effect of magnetic field on the isotherms.

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