Hydromagnetic Fluid Flow Past a Rotating Semi-Infinite Vertical Plate

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ABSTRACT

Stokes problem of a free convective flow past a vertical semi-infinite plate in a rotating system in presence of variable magnetic field taking into account the effect of variable viscosity and joule heating is investigated. The fluid considered is electrically conducting.The study of rotating flow problems is important in geophysical problems, dealing with the sunspot development,the solar cycle and the structure of rotating stars. The fluid is subjected to a variable magnetic field inclined at angle α with the positive direction of z axis in the xz plane. The investigation aims to study the effects of a variable magnetic field with joule heating resulting to Hall currents on MHD Stoke's problem for vertical infinite plate in rotating system. The central finite difference is used to discretisize the spatial variablesandGaussSiedeliterationmethodisusedtodiscretisizetime.Variousparameters:Magnetic parameter(M,) Prandtl number(Pr,) Hall Parameter(m,), Eckert number(Ec,) ,Rotational parameter(R,),Magnetic Reynold number(Rm,),angle of inclination(α)appearing in the dimensionless equations are varied and their effects on the flow variables are discussed in detail with the help of graphs and tables. The skin friction and the rate of heat transfer are calculated using Newton's interpolation formula. We hope to shed light on the way free conversion is generated through cooling and plate heating.

Keywords: Free convection,Magnetic Field,Joule heating, Hall Currents, Skin friction, Heat Transfer

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