Heat and Mass transfer in Magnetohydrodynamic flows past a semi-infinite vertical porous plate

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Abstract

Unsteady free convection incompressible fluid flow past a semi-infinite vertical porous plate in the presence of a strong magnetic field inclined at an angle α to the plate with Hall and Ion-slip currents effects is considered. The partial differential equations governing the flow problem considered in this study are solved by a finite difference approximation while the computation of skin friction, rate of heat transfer and mass transfer at the plate is achieved by Newton's interpolation approximation over the first five points. The effects of modified Grashof number, suction velocity, the angle of inclination, time, Hall current, Ion-slip current, Eckert number, Schmidt number and heat source parameter on the convectively cooled or convectively heated plate restricted to laminar boundary layer are considered.

It was found that increases in Hall parameter m_, modified Grashof number Gc, the removal of suction velocity w0, or a decrease in heat source parameter δ leads to a decrease in skin friction τx due to primary velocity profiles and an increase in skin friction τy due to secondary velocity profiles for Gr > 0 and Gr < 0.

Finally the results are presented in graphs and tables.