

Documents

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Numerical study of unsteady hydromagnetic radiating fluid flow past a slippery stretching sheet embedded in a porous medium
(2018) *Physics of Fluids*, 30 (8), art. no. 083601, . Cited 11 times.

Abstract

This article reports an unsteady two-dimensional Magneto-hydrodynamic (MHD) boundary layer flow of an incompressible electrically conducting fluid over a slippery stretching sheet surrounded in a porous medium. The Roseland boundary layer approximation with the radiative heat flux is employed within the current analysis. The influence of the velocity slip, thermal radiation, heat source, and buoyancy force is also considered within the current analysis, which makes significant effects on the flow field passages. The unsteady system of non-dimensional partial differential equations (PDEs) with corresponding boundary conditions are solved by implementing the explicit finite difference scheme. In the presence of pertinent parameters such as viscous dissipation, heat source or sink, Prandtl number, Grashof number, thermal radiation, magnetic field, and Darcy number, the accurate movement of the electrically conducting fluid over a slippery sheet is shown graphically in the form of velocity, temperature, skin friction coefficient, and Nusselt number. Unlike the other studies, wherein the system of PDEs is commonly transformed into a system of ordinary differential equations via the similarity transformations, the current study provides an efficient numerical procedure to solve a given system of PDEs without using the similarity transformations which exemplify the precise movement of an electrically conducting fluid over a slippery surface. It has been anticipated that the current boundary layer analysis would provide a platform for solving the system of the nonlinear PDEs of the other unsolved boundary layer models that are associated with the two-dimensional unsteady MHD flow over a slippery stretching surface embedded in a porous medium. © 2018 Author(s).

2-s2.0-85051088949

Document Type: Article

Publication Stage: Final

Source: Scopus