

## Abstract

Many natural phenomena and technological applications undergo Magneto hydrodynamics (MHD). Applications such as the drawing of continuous strips of polymers through a die are carried out through a stagnant cooling fluid. The quality of the strips is found to depend on the rates of heat and mass transfer on the stretching surface. To assure quality, it is vital to understand how heat and mass transfer are affected by Hall current, rotation and inclined magnetic field for a free convection fluid flow. Due to wide applications of MHD in science and technology, many scholars have studied a wide variety of flow situations including those that combine Hall current, rotating systems and inclined magnetic field. However, no such studies have incorporated the effects on heat and mass transfer. In this study, we investigate the combined effects of Hall current, rotation and inclined magnetic field on a free convection fluid flow with heat and mass transfer for a fluid flowing over an exponentially accelerated vertical plate. A strong, steady and inclined magnetic field is applied into the fluid region. The coupled non-linear partial differential equations governing the flow are first expressed in dimensionless form then solved using the finite difference method. The skin friction and the rates of heat and mass transfer at each of the boundaries are computed using the least squares approximation method. Numerical values are simulated from the model equations using the MATLAB program. The profiles for velocity, temperature and concentration at various distances from the plate are demonstrated graphically for various parameters values. This study shows that increase in the angle of application of the magnetic field decreases the primary velocity while it increases the secondary velocity. The secondary velocity decreases when the Hall parameter is increased. It however increases when the rotation parameter is increased.