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MAGNETOHYDRODYNAMIC MIXED CONVECTION IN CYLINDRICAL CONTAINER WITH CO-ROTATION END DISKS

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ABSTRACT The effect of vertical magnetic field on liquid-metal flow produced by co-rotation of the top and bottom disks in a vertical cylindrical container with a vertical temperature gradient is numerically analyzed. The fluid flow field was calculated using a finite volume computational fluid dynamics (CFD) model. It was observed that the Reynolds number is increased, the axisymmetric basic state loses stability to circular patterns of axisymmetric vortices and spiral waves. In mixed convection case the axisymmetric mode disappears giving an asymmetric mode m=1. It was also found that the primary thresholds Re_{cr} corresponding to the modes m=1and 2, increase with increasing of the Hartmann number (Ha). We can therefore conclude, after the magnitude of the magnetic field exceeds a certain value the instability switches to a steady bifurcation .Finally stability diagrams have been established according to the numerical results of this investigation. These diagrams giving the evolution of the primary thresholds as a function of the Hartmann number for various values of the Richardson number.