Magnetohydrodynamic co-rotating flow in a vertical cylindrical container

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Description

The effect of an external axial magnetic field on the 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 governing Navier–Stokes, energy, and potential equations along with appropriate boundary conditions are solved using the finite-volume method. Comparisons with the previous results were performed and found to be in excellent agreement. It was observed that the Reynolds number is increased, and the axisymmetric basic state loses stability for circular patterns of axisymmetric vortices and spiral waves. In the 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 modes $m = 1$ and 2, increase with an increase in Hartmann number (Ha). We can therefore conclude that when the magnitude of …