

# Effect of Hall currents on the steady convection of a current-carrying cylindrical plasma

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The effect of Hall currents on the steady convection of a fully ionized current-carrying cylindrical plasma column surrounded by perfectly conducting walls is studied. In general, when the Hall term is large, it can affect the magnetohydrodynamic (MHD) stability problem significantly, but as long as it is small the instability persists and the marginal modes remain the same as without Hall currents. In some cases, though, even if the Hall term is large, the convective character of some modes is not changed. Thus, it is shown that convection due to the combined effect of resistivity and heat conductivity is not affected by Hall currents. However, convection due to heat conductivity and viscosity is no longer possible in the presence of Hall currents. When the combined effect of heat conductivity, resistivity, and viscosity is considered, the Hall term changes the stability properties of the system in such a way that there are no modes that are both marginal and stationary. Consequently,