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Air Convection in a Cubic Enclosure with Laterally Shifted Electric Coil without a Gravity Field

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Numerical computations were carried out for magnetizing convection of air in a cubic enclosure with laterally shifted coil at various elevations. Air is known as a paramagnetic substance and its magnetic susceptibility varies with temperature due to the Curie's law and the convective motion is driven by the magnetic buoyancy force. Magnetic field was generated by an electric current through a coil which was laterally shifted in the X direction and placed at various elevations Z_c. The heat transfer rate was mostly enhanced for the coil shifted horizontally to have a close location of the coil with the hot wall. This work shows that character of convection and the average Nusselt number depends strongly on the horizontal position of the coil and the heat transfer rate is controlled by the magnetic field.

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