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Embbeded dipolar vortices driven by Lorentz forces in a shallow liquid metal layer[1] CINTHYA G. LARA, SERGIO CUEVAS, Universidad Nacional Autonoma de Mexico — We present an experimental and numerical study of the vortex pattern that results from the action of a localized Lorentz force in a thin liquid metal layer (GaInSn) contained in a square box. The fluid motion is generated by the interaction of a uniform D.C. current and a non-uniform magnetic field produced by square-shaped permanent magnet much smaller that the container. Unlike the simple vortex dipole created by a localized Lorentz force in a layer of electrolyte, a more complex vortex pattern is formed in a liquid metal layer. Experiments show the appearance of two "embedded" vortex dipoles with a quasi-stagnat zone in the region of highest magnetic field intensity. The observed pattern can be explained by noticing that the localized magnetic field acts as a magnetic obstacle for the imposed flow. Using the Ultrasonic Doppler Velocimetry technique, we obtained the velocity profiles along the symmetry axis. We developed a quasi-two-dimensional numerical model that takes into account the effect of the boundary layers adhered to the bottom wall, the Hartmann friction and the induced effects. Numerical simulations show a satisfactory qualitative and quantitative agreement with the experimental results.

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