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Generation of local vortical structures in electromagnetically forced flow under a localized time-dependent magnetic field. ALBERTO BELTRAN, EDUARDO RAMOS, SERGIO CUEVAS, Centro de Investigacion en Energia — We report experimental observations of an electromagnetically forced flow in a thin layer of an electrolyte (0.4 cm deep, 30 cm wide, 30 cm long), produced by the interaction of an imposed D.C. Current (0.4 A) and a localized time-dependent magnetic field. The field, generated by a permanent magnet (0.95 cm diameter) placed underneath the electrolyte layer, oscillates harmonically along a direction parallel to the injected electric current with a frequency and amplitude of 0.3 - 2 Hz and 0.15 cm, respectively. In the absence of oscillations, the localized Lorentz force produces a vortex dipole with a jet-like flow along the symmetry line in the direction of the force, perpendicular to both the injected current and the normal magnetic field. When the magnet is set in oscillation two different behaviors are observed. If the oscillation frequency, f, is low ($0.3 < f < 0.45$ Hz) the flow generated in the neighborhood of the magnet forms local vortical structures that are swept away periodically. When the oscillation frequency is high enough (0.45 Hz $< f <$ 2 Hz), the vortex dipole structure remains practically unperturbed. Results point to the existence of a characteristic frequency that intensifies the local generation of vortices and enhances the scalar transport.

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