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Chaotic mixing and superdiffusion in a two-dimensional array of vortices[1] TOM SOLOMON, JUSTIN WINOKUR[2], GARRETT O'MALLEY, Bucknell University, MATTHEW PAOLETTI, University of Maryland at College Park — We present experimental and numerical studies of mixing and long-range transport in an array of vortices forced by a magnetohydrodynamic technique. A current passing horizontally through a thin electrolytic solution interacts with a magnetic field produced by an array of magnets below the fluid. If the current is parallel to one of the primary directions of the magnet array, a square array of vortices is produced. If the current is tilted with respect to the magnet array, however, wavy channels form diagonally through the vortex pattern, allowing tracers in the flow to travel long distances in a short period of time. The addition of a time-dependent current results in a combination of chaotic and ordered vortex/jet regions that produces Levy flights and superdiffusive transport. If an AC current is applied in both cardinal directions, the resulting chaotic mixing is typically barrier-free.

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