## Abstract Submitted for the DFD09 Meeting of The American Physical Society

A Chaotic Periodically Reoriented Irrotational Flow: periments, Theory, and Applications to Geophysical **Transport** GUY METCALFE<sup>1</sup>, DANIEL LESTER<sup>1</sup>, MURRAY RUDMAN<sup>2</sup>, KLAUS REGENAUER-LIEB<sup>3</sup>, MIKE TREFRY<sup>4</sup>, ALISON ORD<sup>3</sup>, BRUCE HOBBS<sup>3</sup>, CSIRO Australia, PANDURANG KULKARNI, University of California, Santa Barbara, PARK KWAN FUNG, University of New South Wales, ZHURUI XU, Universite Pierre et Marie Curie, JEFF MORRIS, City College of New York — A sourcesink pair in a Hele-Shaw cell generates an irrotational dipole flow. In a disk with 360 wells around its periphery and a rotatable manifold controlling which well pairs are open, we have created a periodically reoriented dipole flow which is an open chaotic dynamical system with properties controlled by the reorientation angle and duration of flow. Despite being open the flow can have island regions where fluid that starts in the disk remains there forever. Theory and experiments determine the island existence boundary in control parameter space, the variation in island size, and bifurcations. We also briefly describe possible applications to problems in geophysical transport.

Guy Metcalfe CSIRO Australia

Date submitted: 29 Jun 2009 Electronic form version 1.4

<sup>&</sup>lt;sup>1</sup>Materials Science and Engineering

<sup>&</sup>lt;sup>2</sup>Mathematics and Information Science

<sup>&</sup>lt;sup>3</sup>Exploration and Mining; University of Western Australia

<sup>&</sup>lt;sup>4</sup>Land and Water; University of Western Australia