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Targeting Complete Chaotic Mixing by Destabilizing Key Periodic Orbits in an Electro-osmotic Mixer RODOLPHE CHABREYRIE, Carnegie Mellon University, Mechanical Engineering Department, Pittsburgh, PA 15213, CRISTEL CHANDRE, Centre de Physique Théorique, CNRS-Aix-Marseille Université, Campus de Luminy, case 907, F-13288 Marseille cedex 09, France, PUSHPENDRA SINGH, New Jersey Institute of Technology, Mechanical Engineering Department, NADINE AUBRY, Carnegie Mellon University, Mechanical Engineering Department, Pittsburgh, PA 15213 — The ability to generate complete, or at least well spread, chaotic mixing is of great interest in numerous applications, especially microfluidics. For this purpose, we propose a strategy that allows us to quickly target the parameter values at which complete mixing occurs. The technique is applied to a time periodic, two-dimensional electro-osmotic flow with spatially and temporally varying Helmoltz-Smoluchowski slip conditions. The strategy consists of following the linear stability of some key periodic orbits in parameter space, particularly identifying bifurcation points at which such orbits become unstable. Poincaré maps, Lyapunov exponents and a box counting measure are all computed to validate the strategy.

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