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Analysis of Mixing in a 2D Drop with Time-Periodic Boundary Forcing MICHAEL DAVIS, Claremont Graduate University, AMANDA CLEMM, Scripps College, CECILY KEPPEL, DYLAN MARRINER, ANDREW BERNOFF, Harvey Mudd College, ALI NADIM, Claremont Graduate University — We carry out a detailed analysis on the model problem of Nadim & Miraghaie [Bull. Am. Phys. Soc., **49**, 188 (2004)], which consists of a 2D circular drop driven by a tangential stress applied at its boundary giving rise to a pair of circulating flows in each half of the drop that are periodically reoriented. We characterize the resulting chaotic flow by computing the Lyapunov Exponents (LE) and their Finite-Time counterparts (FTLE) for all initial positions within the drop. We calculate the mean and variance of the FTLEs for a wide range of switching times, and identify the optimal switching time for efficient mixing. At some non-optimal switching times, the drop domain contains a mixing region and non-mixing islands which are associated with a bimodal distribution of FTLEs. For a certain switching time, we identify a group of 4 points (which form a square in the drop) that are permuted by the flow and return to their original positions after 4 switching periods. The space-time trajectories of these points, which can be regarded as virtual "stirring rods," form braids when the flow is chaotically mixing. Calculation of braiding factors associated with different patterns of switching enables us to assess their mixing efficacy. [Supported by Fletcher Jones Fellowships/CCMS]

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