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**Michael J Ward\*** ([ward@math.ubc.ca](mailto:ward@math.ubc.ca)), Dept. of Mathematics, University of British Columbia, Vancouver, B.C. V6R 1Y9, Canada. *Self-Replicating Localized Spot Solutions for Reaction-Diffusion Systems in Two Space Dimensions.*

We analyze the dynamical behavior of multi-spot solutions in a two-dimensional domain for certain two-component reaction-diffusion systems in the singularly perturbed limit of small diffusivity  $\epsilon$  for one of the two components. A formal asymptotic analysis, which has the effect of summing logarithmic series in powers of  $-1/\log \epsilon$ , is used to derive a differential-algebraic system of ODE's characterizing the slow dynamics of the spot locations. By numerically examining the stability thresholds for a single spot solution, a specific and simple criterion is formulated to theoretically predict the initiation of spot-replication events. The analytical theory is illustrated for spot patterns in a square and a disk and the asymptotic theory is compared with full numerical results computed from an adaptive grid PDE solver (Received July 28, 2008)