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The 2D Selective Withdrawal Transition: Analogies with MEM Systems STUART KENT, SHANKAR VENKATARAMANI, University of Arizona — Free boundaries in selective withdrawal systems have been observed undergoing topological transitions through apparently-singular steady states as the withdrawal rate is increased. We transfer the study of this transition to a simpler class of differential equations that are analogous to those found in the study of microelectromechanical (MEM) systems. In true electrostatic free boundary problems, the electrostatic pressure varies as the square of the electric field. Artificially replacing this quadratic dependence with a linear dependence that matches the linear relationship between a Newtonian fluid stress field and velocity gradient components, we obtain a good model for the fluid system with fewer degrees of freedom. By first considering a restricted family of one dimensional boundaries related to two-parameter conformal maps, we aim to identify the mechanisms that control the boundary breakdown in two dimensions.

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