1122-76-46 **Ivan C Christov*** (christov@purdue.edu), West Lafayette, IN 47907. *Self-similar regimes of gravity-driven spreading of viscous liquids in model heterogeneous porous media.*

We discuss a combined experimental–theoretical–computational study of the effects of horizontal heterogeneities on the propagation of viscous gravity currents with applications to porous media flows. Our model geometry is a horizontal channel (specifically, a Hele-Shaw cell) with variable gap thickness in the streamwise direction in the form of a power law. We demonstrate that two types of self-similar behaviors emerge as a result of such horizontal heterogeneity: (a) a"first-kind" solution is found using dimensional analysis for currents that propagate away from the origin (a point of zero permeability); (b) a "second-kind" solution is found using a phase-plane analysis for viscous gravity currents that propagate toward the origin. Using the phase-plane formalism, we construct the universal second-kind self-similar current shape. Additionally, we identify self-similar behaviors in the post-closure regime, i.e., once the current reaches the geometric origin and begins to fill the model porous medium. The theoretical predictions show good agreement with lab-scale experiments and also numerical solutions of the governing PDE developed under the lubrication approximation. Joint work with H.A. Stone and Z. Zheng (Princeton University). (Received August 02, 2016)