

Texas Tech University. Applied Mathematics Seminar.

# One-dimensional two-phase generalized Forchheimer flows for incompressible fluids

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**ABSTRACT.** We derive a non-linear system of parabolic equations to describe the hydrodynamics of the one-dimensional two-phase Forchheimer flows of incompressible, immiscible fluids in porous media, in the presence of capillary forces. Under relevant constraints on relative permeabilities and capillary pressure, non-constant steady state solutions are found and classified into six-teen types according to their monotonicity and asymptotic behavior. For a steady state whose saturation can never attain either value 0 or 1, we prove that it is stable with respect to a certain weight function. Such a weight function is comprised of the steady state, relative permeabilities and capillary pressure. The proof is based on specific properties of the steady state, weighted maximum principle and Bernstein's estimate.