1127-35-226   **Jan Prüss**, jan.pruess@mathematik.uni-halle.de, and **Gieri Simonett***, gieri.simonett@vanderbilt.edu. *On the Muskat flow.*

Of concern is the motion of two fluids separated by a free interface in a porous medium, where the velocities are given by Darcy's law. We consider the case with and without phase transition. It is shown that the resulting models can be understood as purely geometric evolution laws, where the motion of the separating interface depends in a non-local way on the mean curvature. It turns out that the models are volume preserving and surface area reducing, the latter property giving rise to a Lyapunov function. We show well-posedness of the models, characterize all equilibria, and study the dynamic stability of the equilibria. Lastly, we show that solutions which do not develop singularities exist globally and converge exponentially fast to an equilibrium. (Received February 04, 2017)