On the Selection Principle for Viscous Fingering in Porous Media
YANNIS C. YORTSOS\textsuperscript{1}, University of Southern California, DOMINIQUE SALIN\textsuperscript{2}, University Pierre et Marie CURIE (Paris 6) — Viscous fingering in porous media at large Peclet numbers is subject to an unsolved selection problem, not unlike the Saffman-Taylor problem. The mixing zone predicted by the entropy solution of the resulting hyperbolic problem, is found to spread much faster than what is observed experimentally or by fine-scale numerical simulations. In this paper we apply a recent approach by Menon and Otto (Com. Math. Phys, 257, 303-317, (2005)) to develop bounds in the growth of the mixing zone. These predict growth velocities smaller than what is obtained by the entropy solution. For an exponential viscosity-concentration mixing rule, the mixing zone velocity is shown to be bounded by $\frac{(M-1)^2}{M M^* M}$ which is significantly smaller than the entropy solution result $\left(M - \frac{1}{2M}\right)$.

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