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## High order methods for the simulation of viscous fingering

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A high order method is formulated for solving the miscible displacement problem and modeling viscous fingering. Viscous fingering in porous media may occur when a fluid with low viscosity is used to displace a fluid with high viscosity. For this type of flow instability, a tiny perturbation can be amplified exponentially, which triggers a finger-like pattern in the fluid concentration profile during the fluid displacement.

The miscible displacement problem consists of a coupled system of differential equations with primary unknowns pressure and concentration of the injected fluid. The numerical method is based on the discontinuous Galerkin method with weighted average stabilization technique and flux-reconstruction post-processing. Simulations in two and in three dimensions show the growth and propagation of fingers for large mobility ratios and large Peclet numbers. Results are compared with those obtained by using a generic cell-centered finite volume method. Finally we show some scalability results for a three-dimensional core flooding.

### References

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