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High resolution viscous fingering simulation in miscible displacement using a  $p$ -adaptive discontinuous Galerkin method with algebraic multigrid preconditioner

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## Highlights

- We present two techniques to speedup large scale simulations of viscous fingering in miscible displacement.
- The first technique relies on a simple  $p$ -adaptive scheme and results in significant reduction in the number of degrees of freedoms.
- In the second technique, we design an algebraic multigrid (AMG) to improve the solver efficiency.
- With the two improvements, we can perform high resolution three-dimensional viscous fingering simulations required for miscible displacement with high Peclet number and mobility ratio in greater detail than before.

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