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# Nonlinear finite-volume schemes for complex flow processes and challenging grids

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The numerical simulation of subsurface processes requires efficient and robust methods due to the large scales and the complex geometries involved. To resolve such complex geometries, corner-point grids are the industry standard to spatially discretize geological formations. Such grids include non-planar, non-matching and degenerated faces. The standard scheme used in industrial codes is the cell-centered finite-volume scheme with two-point flux (TPFA) approximation, an efficient scheme that produces unconditionally monotone solutions. However, large errors in face fluxes are introduced on unstructured grids. The authors present a nonlinear finite-volume scheme applicable to corner-point grids, which maintains the monotonicity property, but has superior qualities with respect to face-flux accuracy. The scheme is compared to linear ones for complex flow simulations in realistic geological formations [1,2]. In addition, we present recent developments regarding convergence analysis for a family of nonlinear finite-volume schemes [3].

## References

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[3] Schneider, M., Agélas, L., Enchéry, G., & Flemisch, B. (2017). Convergence of nonlinear finite volume schemes for heterogeneous anisotropic diffusion on general meshes. Journal of Computational Physics, 351, 80-107.

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