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A linearly stable, implicit WENO scheme applied to two-phase flow in porous media

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We present a general implicit weighted essentially non-oscillatory (iWENO) method for solving advection-diffusion equations that is locally conservative and third order accurate, simple to implement, and allows general computational meshes. The scheme is quite robust, since it is unconditionally stable for smooth solutions to linear problems in 1D. The scheme requires only two unknowns per computational mesh element, independent of the spatial dimension, so it maximizes the mesh resolution. This is important physically, so that natural heterogeneities in porous materials can be resolved, which alone can allow fine features in the medium and/or the solution to be well resolved. It is also important computationally for modern high performance computers, which are memory bandwidth limited, since the scheme emphasizes many local computations using a small amount of data. Application to two-phase flow in porous media will be presented.

References

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