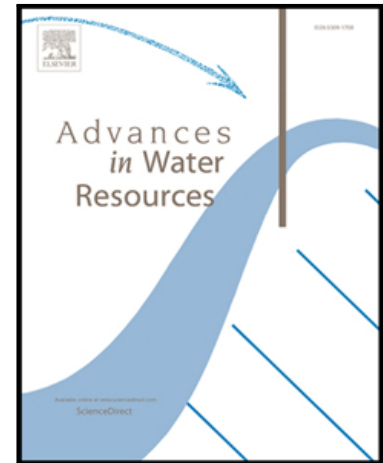


## Accepted Manuscript

Efficient C1-continuous Phase-Potential Upwind (C1-PPU) Schemes for Coupled Multiphase Flow and Transport with Gravity

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**Highlights**

- Devise and analyze a novel numerical flux scheme called C1-PPU.
- The scheme is smooth with respect to saturations and phase potentials.
- The scheme achieves a balance between scalar nonlinearity and accuracy.
- The scheme applies to coupled flow and transport with multiple phases.
- The properties of C1-PPU are studied and the related proofs are provided.

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