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Semi-Analytical Particle Tracking Scheme For Advective/Diffusive Transport in Porous Media

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Semi-Analytical Particle Tracking Scheme For Advective/Diffusive Transport in Porous Media

The particle tracking scheme of David W. Pollock [Ground Water 26(6), 1988] provides a computationally efficient and mass-conservative method for Lagrangian transport in the absence of diffusion. In this work, a generalization of Pollock's scheme that allows for the inclusion of diffusion is presented. The new scheme is based on a semi-analytical representation of the advective/diffusive motion. The scheme does not require stepping at sub-grid-cell time or length-scales and thus is computationally efficient. It is formulated in such a way that it becomes exact for Pe going to zero and infinity, and provides an accurate numerical approximation in the intermediate Pe number range. Application examples dealing with Darcy flow in heterogeneous porous media and Stokes flow in resolved pore-space geometries document the capabilities of our new scheme.

References

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