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Mechanisms of Solute Mixing in Darcy's scale Heterogeneous Formations

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Solute mixing in porous media plays a fundamental role in a variety of contexts, e.g., environmental risk assessment, geochemical reactive transport. Mixing dynamics are strongly impacted by the heterogeneity of the hosting porous media which leads to inhomogeneity of concentration within the spreading and the mixing volume. Considering Darcy's scale heterogeneous formations, we develop a randomly dispersive lamellae approach in which the variability in the dispersion rates of the lamellae that constitute a solute plume is recognized as a fundamental aspect of the mixing dynamics. The framework allows rending the inhomogeneity of the concentration distribution within the mixing volume before the late time well-mixed condition is reached. Furthermore, In light of the hidden (data scarcity) and heterogeneous nature of environmental porous formations, the degree of mixing of a solute plume is uncertain. The proposed randomly dispersive lamellae framework represents a strategy to quantify the latter. We test our approach for mildly to highly heterogeneous formations.

Participation

In-Person

References

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