Abstract Submitted
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A hybrid parallel solver for flow and scalar transport in complex geometries[1] DAZHI YU, TONY LADD, University of Florida — We have developed a hybrid parallel solver to simulate flow and transport in an explicit pore topography. The lattice Boltzmann (LB) method was used to determine the fluid velocity, and a finite difference scheme was used to solve for the scalar transport. At high Peclet numbers the scalar field can vary more rapidly than the fluid velocity, especially near solid boundaries. Thus the resolution of velocity and scalar fields can be chosen independently. Solid-fluid interfaces of arbitrary geometric complexity can be described by the distance of each surface point from a regular grid just inside the solid. These surface points lie on grid lines intersecting the surface. At each point, precipitation/dissolution reactions can occur, based on the local scalar concentration. During erosion or precipitation, the points move normal to the surface, and are interpolated back to the grid lines using a cubic Bezier surface constructed around the old intersection point. Because of the large aspect ratio of typical fractures, we require a high fidelity finite difference method to solve for the scalar field. We have designed a scheme that solves along characteristics (like the LB solver), which is much more accurate than a Lax-Wendroff method when the flow is oriented away from the grid lines.

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