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Fluid and particulate suspension flows at fracture junctions[1] TAK S. LO, JOEL KOPLIK, The Levich Institute and the Physics Department, City College of New York, CUNY — Suspended particles can be a serious problem in geological contexts such as fluid recovery from reservoirs because they alter the rheology of the flowing liquids and may obstruct transport by narrowing flow channels due to deposition or gravitational sedimentation. In particular, the irregular geometry of the fracture walls can trap particles, induce jamming and cause unwanted channeling effects. We have investigated particle suspension flows in tight geological fractures using lattice Boltzmann method in the past. In this work we extend these studies to flows at a junction where two fractures intersect, an essential step towards a complete understanding of flows in fracture networks. The fracture walls are modeled as realistic self-affine fractal surfaces, and we focus on the case of tight fractures, where the wall roughness, the aperture and the particle size are all comparable. The simulations provide complete detail on the particle configurations and the fluid flow field, from which the stresses in the fluid and the forces acting on the bounding walls can be computed. With these information, phenomena such as particle mixing and dispersion, mechanical responses of the solid walls, possible jamming and release at junctions, and other situations of interest can be investigated.

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