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Fluid-driven particle transport patterns in fractures

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It remains challenging to fully understand the granular transport mechanisms in confined geometries like fractured media. Here, by performing massively parallel simulations based on a coupled computational fluid dynamics and discrete element method (CFD-DEM) approach, we systematically investigate the particle transport patterns and mechanisms driven by fluid flow in both smooth and rough fractures. In smooth fractures, depending on the local drag force, the particles can settle or suspend in the fluid, leading to fluid-driven particle transport by creeping or by suspension. Fluid-induced fingering patterns are observed in the upper layer of settled particles during the sliding. It is shown that the fingering pattern is affected by the flow rate and particle volume fraction. In rough fractures, increasing the standard deviations of the aperture shifts the particle migration from uniform to fingering behavior, which leads to earlier breakthrough and increased particle trapping.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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