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Flow Regimes on Smooth Fracture Surface Replica

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Flow Regimes on Smooth Fracture Surface Replica

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Recent flow visualization experiments and conceptual modeling efforts enabled identification of several distinct flow regimes in unsaturated individual fractures subjected to different initial and boundary conditions. Delineation of these dissimilar flow regimes is an essential step in the development of a self-consistent conceptual model of flow for single fractures. This study is concerned with flow on relatively smooth fracture surfaces. We present theoretical constraints for the existence of some important flow regimes in idealized smooth fracture surfaces. The flow regimes considered, in the order of increasing flow rate, are: flow of adsorbed film, sliding drops, rivulet flow, stable film flow, and wavy film flow. These theoretical analyses are corroborated with observations from flow visualization experiments.