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Post-breakthrough finger evolution in unstable growth processes

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Interface between two phases, for instance two fluids as in viscous fingering, often grows in an unstable way. Fingers emerge from growing instability and compete for the available flux. This leads to effective repulsion between the fingers and screening of the shorter ones. While much interest was put into studying such systems before the interface reaches the boundary of the system, very little is known what happens after breakthrough. We show that a striking transition in growth dynamics takes place as the leading finger reaches the boundary of the system. The shorter fingers revive then and grow toward the leading one forming loops. These effects are observed in classical viscous fingering and microfluidic fracture dissolution experiments, but also in discharge patterns and gastrovascular canal system of jellyfish.

Participation

In-Person

References

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