Contribution ID: **744** Type: **Oral Presentation**

Quantification of non-linear multiphase flow in porous media for both water-wet and mixed-wet conditions

Friday, 4 June 2021 15:45 (15 minutes)

The flow of multiple fluids in porous materials occurs in a wide variety of important natural and engineered settings relevant for the understanding of geological CO2 storage, geothermal energy extraction, magma flow, oil and gas recovery, contaminant transport, flow in fuel cells, microfluidics in drug delivery, and the effectiveness of respirators and surgical masks. However, the transition from traditional Darcy flow to non-linear flow is always a 'mystery'. Here, we measure the pressure differences during two-phase flow across sandstone sample (both water-wet and mixed-wet conditions) for a range of injection rates and fractional flows, during an imbibition experiment. We quantify the onset of a transition from a linear relationship between flow rate and pressure gradient to a non-linear power-law dependence. We show that the transition from linear (Darcy) to non-linear flow and the exponent in the power-law is a function of fractional flow. We use energy balance to propose a new Y number equation, and then the first time accurately predicts the onset of intermittency for a range of fractional flows, fluid viscosities and different rock types.

Time Block Preference

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

References

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