Contribution ID: **18** Type: **Oral Presentation**

Dispersion and Retention of Colloids in Saturated Sandstone from the Microscale to the Macroscale

Tuesday, 31 May 2022 10:30 (15 minutes)

Transport of suspended colloids in heterogeneous porous media is a multi-scale process which systematically exhibits preasymptotic behaviors that cannot be captured by the Fickian dispersion theory. Although many studies have documented and quantified mechanisms of colloid transport, they often lack a theoretical basis that links particle- to continuum-scale observations. The experimental observations of preferential deposition of colloids on various pore surfaces, as well as colloids'dispersion in heterogeneous flow fields should be responsible for the preasymptotic behaviors.

To fill this knowledge gap and test our hypothesis, we implement here a multi-scale approach. We compare residence time distributions (RTDs) of solutes and colloidal particles in a heterogeneous media –sandstone sample –and its digital twin, by using core-flooding experiments, core- to-representative elementary volume-scale numerical simulations, and kinetic theories.

We achieve agreement across the multiple scales of our multidisciplinary investigation. Based on this agreement, we show that the observed preasymptotic transport is particle-type dependent and stems from particles' dispersion in heterogeneous flow fields as well as from their deposition on pore surfaces due to electrostatic interactions. A general RTD formulation is derived that encompasses the full set of observations and enables investigations of a full transition from preasymptotic to asymptotic behaviors.

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Time Block Preference

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

Participation

Online

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