Pore Scale Simulation of Tailing

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When performing solute transport in porous media one often observes macroscopic tailing, even with non-sorbing solutes. This is typically traced back to structural heterogeneity and heuristically represented by the mobile-immobile model (MIM). However, tailing has also been observed in an almost perfect uniform medium.

In this presentation we show pore scale numerical experiments to elucidate the MIM. The time-dependent Convection-Diffusion equation was solved in some randomly generated porous domain. The velocity field was calculated using the Stokes equation. The method was verified using some artificial domains and velocity fields.

The results of the simulation showed significant tailing, demonstrating that tailing can indeed be a pore scale effect. Stagnant zones were also observed, as required by the MIM. The method can be used to estimate effective MIM parameters and relate them to the Peclet number and to Pe_{macro}/Pe_{micro}.