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Solute dispersion in unsaturated porous media - a high-resolution lab experiment

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Transport of solutes through natural and artificial porous media plays an important role in contaminant hydrology and, when it comes to heterogeneous media, involves challenging issues of complex systems. Translucent porous media in Hele-Shaw cells allow the determination of water saturation and concentration distributions by absorption of light.

In this study, the transport of conservative solutes through a quasi two-dimensional porous medium is investigated with spectroscopic light transmission. Images of the Hele-Shaw cell are taken at different wavelengths to obtain simultaneous distributions of water saturation and concentration of an injected dye tracer at high temporal and spatial resolution.

We study experimentally the transport of initially narrow tracer pulses under unsaturated conditions with constant vertical flux and we examine the influence of saturation and flux on solute dispersion.