

Seminar series

Saturation and heterogeneity impact on solute mixing in porous media

by Dr. Oshri Borgman
MIGAL – Galilee Research Institute
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at 13:15, Seminar room, building 9

Solute transport and mixing phenomena in porous media are ubiquitous in the environment and impact nutrient and contaminant transport in soils, CO₂ sequestration, soil and aquifer remediation, and microbially-mediated nutrient cycling. These processes occur in heterogeneous media and often under unsaturated flow conditions in the soil and the vadose zone. Solute mixing, in particular, control reaction rates and is, therefore, essential for reactive transport processes.

Local flow velocity variations influence mixing rates and are affected by porous medium heterogeneity and saturation degree. In addition, mixing and reaction rates vary over sub-pore length scales, demanding an experimental approach and a modeling framework to resolve microscopic length scales. In this seminar, I will present recent results from conservative and reactive solute transport experiments in heterogeneous porous media under varying saturation degrees. The transparent porous media flow cells enable direct visualization of solute transport processes and detailed quantification of solute concentrations and their gradients. The impact of structural heterogeneity and how it controls fluid distribution and solute transport patterns will be emphasized. I will also highlight the relevance of solute transport phenomena to soil biological processes



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