Seeing inside the grid cell: geophysical and NMR constraints on critical zone groundwater, pore water exchange, and fluid-rock interactions

EIT Distinguished Environmental Lecture Series, 8th



Chi Zhang

Time
October 28, 2026 10:00-11:30 AM

Venue
201, Safewell Building
盛威楼 201

Tencent Meeting ID
431-926-534

Biography

Chi Zhang is Associate Professor of Environmental Geophysics at the University of Vienna. She is also Director of the Vienna International School of Earth and Space Sciences (2026–2028). She was previously an Assistant Professor in the Department of Geology at the University of Kansas (2015–2020), where she remains an adjunct professor. Her research group combines laboratory experiments, pore-scale modelling, and field geophysical methods, especially low-field NMR and induced polarization, to quantify groundwater distribution, fluid-rock interaction, and reactive transport in the critical zone. She leads research projects funded by EU, Austrian Science Foundation, Austria's Agency for Education and Internationalization, and City of Vienna. She was President-elect and President of the American Geophysical Union Near Surface Geophysics Section (2021–2024).

Abstract

Groundwater and reactive transport models give every grid cell a handful of effective parameters: hydraulic conductivity, specific yield, a water retention curve, mobile-immobile exchange rates and a permeability-porosity relationship. However, most of these parameters are calibrated rather than measured due to the difficulties in direct sampling and/or observations. Geophysical methods offer cost effective characterization of these same processes with broad spatiotemporal coverage. Yet translating a geophysical signal into a quantitative model parameter requires an understanding of pore scale physics.

In this talk, I will show how my group builds that link. I will show how low-field nuclear magnetic resonance (NMR) and electrical methods can characterize fluids and fluid-rock interactions in soils and rocks. I will pay special attention to how NMR relaxation and multimodal measurements yield information on fluid state, pore structure, solute exchange and evolving mineral-fluid interfaces. I will show examples ranging from groundwater flow paths in a karst aquifer to water films and pore exchange in unsaturated media and to mineral dissolution, with brief notes on freeze-thaw process and an AI agent for NMR interpretation. Drawing on these examples, I will open a discussion where geophysics and groundwater modelling could advance together.

Host

Chunmiao Zheng

Chair Professor and Vice President
AGU Fellow