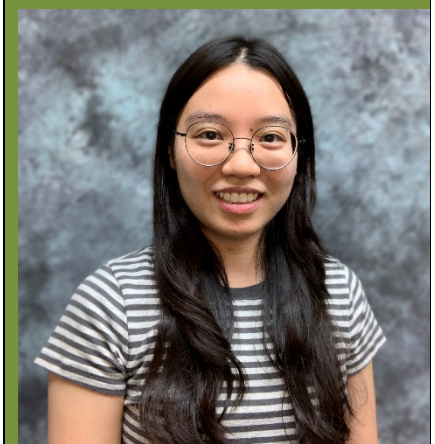
Department of Civil & Environmental Engineering
Missouri Water Center (MWC)

Seminar in Environmental Engineering

Time: **Friday, October 24, 2025**
2:00 P.M. – 3:00 P.M.

Location: **E2511, Lafferre Hall**



Jiamin Mai is a graduate research assistant in the Department of Civil and Environmental Engineering at the University of Missouri, Columbia, MO. Her research is centered on the fate and transport of per- and polyfluoroalkyl substances (PFAS) in water, aiming to understand their behavior in the environment to inform effective remediation strategies and protect water quality.

Unexpected Retardation of PFAS in a Simulated Aquifer

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https://umsystem.zoom.us/j/91084660904?pwd=60ae8GfryXpOU4oMzzJYGayt8ExrBy.1
Meeting ID: 910 8466 0904
Passcode: 447046

Per- and polyfluoroalkyl substances (PFAS) are a class of persistent contaminants frequently detected in groundwater worldwide. Their resistance to natural degradation and strong affinity for environmental interfaces make them a major concern for long-term water quality and human health. While numerous laboratory studies have examined PFAS transport in either unsaturated or saturated zones, limited attention has been given to the transitional capillary fringe where diffusion and transient flow dominate. To address this knowledge gap, a tank-scale flow cell system was employed to simulate PFAS migration under hydrologic conditions that mimic natural aquifers, including intermittent flow, water table level changes and biochar amendment.

The results demonstrate that intermittent flow significantly enhances PFAS retardation compared to continuous flow, primarily due to redistribution and retention within the capillary fringe. Conventional equilibrium models based solely on solid-phase adsorption were found to overestimate retardation for short-chain PFAS and underestimate it for long-chain species. Biochar amendment effectively increased PFAS retention and delayed breakthrough, particularly for longer-chain compounds, confirming its promise as an *in-situ* remediation material. Molecular dynamics simulations further revealed that PFAS adsorption onto quartz is energetically unfavorable, while adsorption onto biochar is spontaneous and exothermic. Together, these findings provide new mechanistic insights into PFAS fate in variably saturated systems and support the development of sustainable remediation strategies for contaminated groundwater.