UTSA Geological Sciences

And

Institute of Water Research, Sustainability and Policy (IWRSP)

Seminar Presentation

By

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On

Friday, November 13, 2020
4:00 P.M.

"Mobilization and transport of geogenic trace elements in a crude oil-contaminated aquifer"

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Abstract
Potentially toxic trace elements adsorb to ferric hydroxide minerals in aquifer sediments, and thus are immobile in groundwater. However, changes to aquifer geochemistry can mobilize these sorbed trace elements, creating a threat to groundwater quality and ecological health. In a crude oil-contaminated aquifer near Bemidji, MN, hydrocarbons from the oil biodegrade coupled to the reductive dissolution of ferric hydroxide minerals. As the hydroxides dissolve, trace elements that were sorbed to the hydroxides are also mobilized into groundwater. I will present groundwater and sediment field data that demonstrate the mobilization of arsenic, barium, cobalt, nickel, and strontium due to biodegradation coupled with iron reduction in the contaminated aquifer and different natural attenuation mechanisms for mobilized cations (barium, cobalt, nickel, and strontium) and anions (arsenic as oxyanions). A reactive transport model will show the predicted transport of arsenic for ~400 years and show that mobilized arsenic may pose a greater long-term threat to water quality than the most toxic oil molecule from the spilled oil, benzene.

Dr. Brady Ziegler joined the Department of Geosciences at Trinity University in 2018. His research uses hydrogeologic, geochemical, and microbiologic principles to evaluate the biogeochemical cycling of groundwater contaminants. He is particularly interested in how human activity (oil spills, biofuel releases, agriculture fertilization, well installation methods, etc.) can trigger chemical disequilibrium in aquifers and mobilize naturally occurring trace elements from aquifer solids into groundwater. He has been conducting research at the Bemidji, MN crude oil spill site for eight years to investigate unforeseen consequences of oil spills and enhanced remediation strategies.