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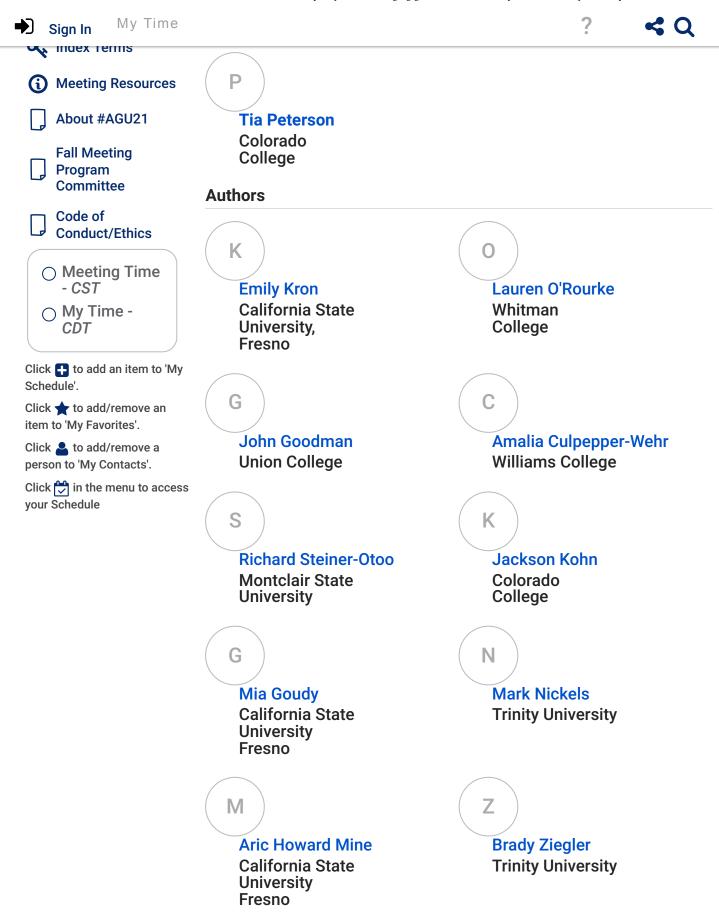
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H550-0902 - Microbial community response to changing groundwater chemistry in the San Joaquin Valley

- Friday, 17 December 2021
- 16:00 18:00
- Onvention Center Poster Hall, D-F

Abstract

The Central Valley of California is one of the most agriculturally productive regions of the world, relying on groundwater to support its domestic, municipal, and agricultural water needs. Groundwater contamination is a pervasive concern in the San Joaquin Valley as a result of anthropogenic, abiotic, and biotic processes. Elevated concentrations of trace elements in groundwater such as As, U, and Cr are likely related to anthropogenic forcing, but are naturally occurring within Central Valley sediments. Here we study the microbiological processes underpinning contaminant release and how they inform approaches to improving water quality and reducing municipal water treatment costs. This research explores how microbial communities shift and are altered by geogenic and anthropogenic contaminants, as well as the use of indicator microbes to diagnose and mitigate fouled wells. We sampled both monitoring and production wells in the City of Fresno with documented contamination by H2S, As, Mn, Fe, and/or NO3-. We hypothesize that contaminant release is linked to the microbial community as well as aguifer chemistry. To assess microbial community composition, 16s rDNA was extracted from groundwater samples and sequenced to document community composition. Community structure was measured alongside water chemistry, and groundwater level. Microbiological community and water chemistry comparisons between production and monitoring wells suggest that there is a disconnect between sites presumed to access the same aguifer, highlighting the complexity of subsurface environments. Redox chemistry and pH also varied across the wells tested concomitant with microbial community structure. Evaluating microbial community change in response to agricultural and anthropogenic water demand supports prediction and mitigation of contaminated wells. We propose microbial community structure and biogeochemical mechanisms directly impact groundwater quality via mobilization and manipulation of natural and anthropogenic contaminants. The ability to more accurately and immediately connect the microbiological community of the aquifer to water chemistry has potential to improve human and ecological health and reduce municipal water treatment costs.



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