

2005 Salt Lake City Annual Meeting (October 16–19, 2005)

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ELEVATED LEVELS OF NATURALLY-OCCURRING URANIUM IN GROUND WATER IN MODESTO, CALIFORNIA

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Elevated levels of naturally-occurring uranium commonly occur in ground water in the eastern San Joaquin Valley, California, where ground water is used for drinking water. The source of the dissolved uranium is granitic sediment in the Sierra Nevada. Monitoring wells were installed and sampled along a ground-water flow path in Modesto, California, as part of a USGS study to characterize the source, transport, and fate of anthropogenic and natural contaminants to a public-supply well.

Hydraulic gradients and water chemistry data indicate that high-alkalinity, oxygen-rich recharge water, possibly altered geochemically by agricultural and other land-use activities, is leaching uranium from shallow sediments and migrating downward through the aquifer. Although movement of the impacted water is hindered by the presence of distributed fine-grained material, breakthrough of the recharge front is detectable along the flow path at depths greater than 55 meters. Within the vertical profile of effected water, the isotopic ratios of uranium-234 to uranium-238 for recently recharged water at the water table are different from those for older water that has moved to a depth of about 45 meters. Below this depth, uranium concentrations and alkalinities are low, likely reflecting older, pre-1960s water that was recharged under natural conditions; however, continued downward movement of uranium poses a threat to the public-supply well, which extracts water primarily from the deep aquifer.

Experiments using sediment cores from the monitoring-well sites were done to quantify the exchangeable uranium fraction and the adsorptive behavior of uranium on selected sediments throughout the vertical profile. Extraction results show a reservoir of uranium bound to iron oxides that may be partially mobilized by elution with high bicarbonate water. Initial adsorption results indicate leaching of uranium from the shallow sediments, whereas deeper sediments showed appreciable uranium adsorption. Future column experiments will test the effect of increasing bicarbonate concentrations on uranium sorption of the deeper sediments and hence the long-term fate of uranium in the aquifer system.

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[Geochemistry \(Posters\)](#)

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