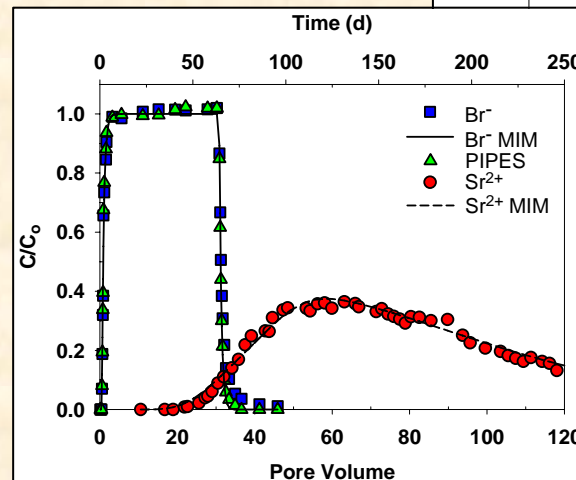
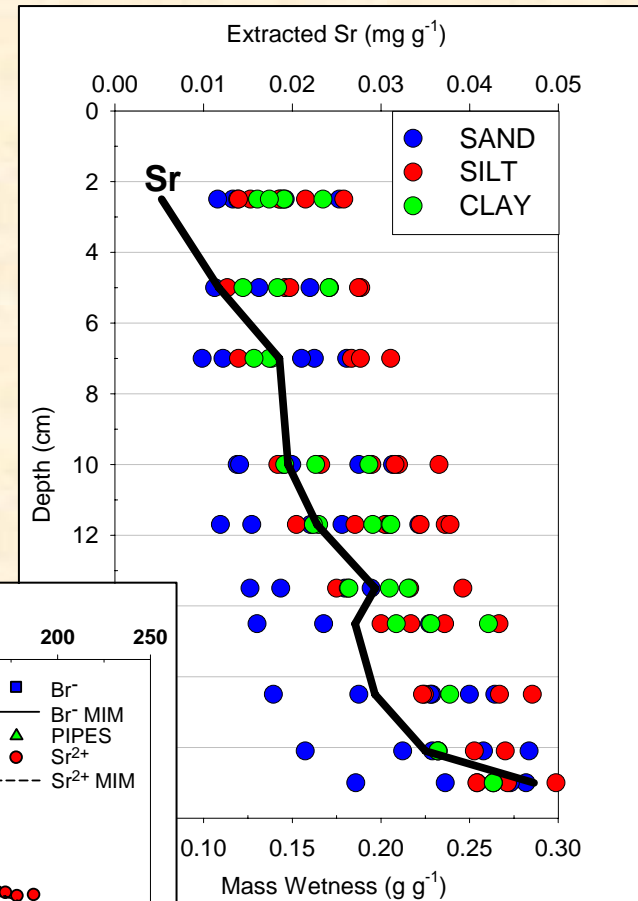


Fate and Transport of Sr²⁺ in Partially-Saturated, Heterogeneous Hanford Sediments

Contact: Melanie Mayes, mayesma@ornl.gov, 865-574-7336

DOE/Office of Science/Biological & Environmental Research/ERSP ERKP634

- ↪ An uncertain relationship between water content, particle size, and sorption in Hanford vadose zone inhibits prediction of contaminant mobility, e.g., ⁹⁰Sr
- ↪ Sr²⁺ is introduced into an intact, layered, heterogeneous sediment core
- ↪ Core dissection shows that sorbed Sr²⁺ is associated with dry, sandy sediments
- ↪ Water content is inversely related to hydraulic conductivity
- ↪ Dry, coarse sedimentary layers may therefore be effective “sinks” for contaminants in heterogeneous vadose zones



Fate and Transport of Sr²⁺ in Partially-Saturated, Heterogeneous Hanford Sediments

Contact: Melanie Mayes, mayesma@ornl.gov, 865-574-7336

DOE/Office of Science/Biological & Environmental Research/ERSP ERKP634

Strontium-90 and other contaminants have migrated into the vadose zone beneath leaking storage tanks at the DOE's Hanford Reservation. The goal of this research was to determine whether hydrological processes in intact, layered, partially-saturated sediments can influence the geochemistry of the system and hence control transport of Sr²⁺ and SrEDTA²⁻. Displacement of Sr²⁺ through a partially-saturated layered sediment core resulted in less retardation and more irreversible sorption than was observed in saturated, repacked columns, and model results suggested a significant reservoir (49%) of immobile water was present during transport through the heterogeneous layered sediments. The layered sediment core was subsequently disassembled along distinct bedding planes and subjected to sequential extractions. Strontium was unequally distributed between carbonates (49%), ion exchange sites (37%), and oxides (14%). An inverse relationship between mass wetness and Sr²⁺ suggested that sandy sediments of low water content constituted the immobile flow regime. Our results suggested that the sequestration of Sr²⁺ in partially-saturated, heterogeneous sediments was most likely due to the formation of immobile water in drier regions having low hydraulic conductivities. The implications are that coarse sediments may constitute a significant "sink" for contaminant species in the Hanford vadose zone.

Pace, M.N., Mayes, M.A., Jardine, P.M., McKay, L.D., Yin, X.L., Mehlhorn, T.L., Liu, Q., and H. Gürleyük. 2006. Transport of Sr²⁺ and SrEDTA²⁻ in partially-saturated and heterogeneous sediments. *Journal of Contaminant Hydrology*, doi:10.1016/j.jconhyd.2006.11.006.