

Quantifying Vadose Zone Flow and Transport Uncertainties Using a Unified, Hierarchical Approach

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Significance

- Vadose zone heterogeneity
 - can have a significant effect on flow and transport
 - is often conceptualized realistically but is given a simplified representation in models
- Remediation and waste management decisions
 - require estimates of future impacts (predictions)
 - require estimates of prediction uncertainty
- Characterization
 - No systematic, proven strategy for effectively allocating limited funds

Project Objectives

- Apply indirect methods for estimating hydraulic and transport parameters to conditional simulation of water flow and solute transport in the vadose zone
- Evaluate relationships between data type, quantity, and measurement scale on accuracy and uncertainty of simulation results
- Develop guidance for application of novel parameterization methods for predictive modeling of vadose zone contamination and remediation problems

Methods

- Geophysical measurements as a source of hard and soft data
- Neural network methods to derive pedotransfer functions relating physical and hydraulic properties
- Similar media scaling and conditional geostatistical simulation to parameterize models
- Infiltration/tracer field experimental data to evaluate methods and develop guidance

Sample Measurements

- Particle size distribution, bulk density, porosity, water retention, and hydraulic conductivity
- Number of samples being analyzed:
 - 21 from S-1
 - 12 from S-2
 - 15 from S-3
- Analysis should be complete in January



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