Project Number 70267

A Hydrologic-Geophysical Method for Characterizing Flow and Transport Processes within the Vadose Zone

02/25/2000

RESEARCH OBJECTIVE

The objective of this study is to analyze flow within the vadose zone during a mid-scale hydrologic test to and to characterize transport processes in-situ. This project will employ numerical and experimental tools that have been developed under a previously funded EMSP proposal (project number 55332). Geophysical imaging techniques will be employed to image the changes produced by the transport experiments in-situ as they occur. Results will help to better understand flow and transport modes within the vadose zone at DOE sites, including the influence of natural heterogeneities and man-made structures. In addition the data will provide checks against which numerical flow and transport simulations can be compared.

RESEARCH PROGRESS AND IMPLICATIONS:

As of the 6th month of a 36-month project, we are monitoring the progress of an infiltration experiment that was begun and continues under a previously funded EMSP project (see report on project 55332 for more information). We believe that the infiltration has reached steady state conditions and are in the process of validating both the geophysical imaging results as well as the various hydrologic measurements that have been made by collecting and analyzing subsurface samples. Students are being trained to operate the equipment and produce the geophysical images as those students that were involved in the first project have recently graduated. Two-dimensional (2D) and three-dimensional (3D) geologic models are being constructed using the geophysical images, well logs, and core samples that were collected prior to the infiltration beginning. These models will be later used to simulate the flow and transport experiments.

PLANNED ACTIVITIES

In the near future we will begin simulating flow and transport experiments at the site using the models constructed from the preinfiltration data. These results will then be used to design a transport experiment, and modifications will be made on the infiltration system such that a salt tracer can be introduced simultaneously with the water that is producing the infiltration event. Modifications will be made to the geophysical imaging schemes such that they are optimized to image changes in the subsurface that occur due to the transport experiment. Once all modifications are complete, the transport experiment will be initiated, during which time geophysical and hydrologic data will be collected on a regular basis.