Modeling of Solute Transport in Porous Media

Predictions of contaminant transport in groundwater, as well as monitoring and management, are based on quantitative models of solute motion. Present methods are inadequate because they fail to use measured data in a sophisticated way, they do not account realistically for the effects of heterogeneity in the conductivity, they do not offer an economic means of designing a monitoring scheme, and they do not link the predictions with any criterion of goodness of fit. In this research, a new modeling strategy is developed, which considers the aquifer hydraulic properties, the velocity field, and the solute concentration as spatially correlated random functions, and hence allows for both spatial variability and prediction uncertainty to be analyzed with probabilistic tools. This research involves theoretical developments as well as extensive field application for model verification. The models and methods we developed are used for estimating the extent of contamination for environmental performance and risk assessment and for investigation of nuclear waste repository sites.

Modeling of Solute Transport in Porous Media

Geostatistical Methods for Site Characterization

Geophysical Imaging for Contaminated Site Characterization